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ABSTRACT

The Global Thinking Project at Georgia State University and the Department of Middle Secondary Education and Instructional Technology sponsored a Symposium on Global Thinking Research, in November, 1993. The following 11 papers were presented at the symposium: (1) "Teaching Students to Think Globally" (Jack Hassard); (2) "Introducing Global Thinking to Students in an Australian Secondary School" (Paul McColl); (3) "The Global Thinking Project in Catalunya (Barcelona)" (Narcis Vives and Anna Pinero); (4) "Global Thinking in an American Middle School" (Sarah Crim); (5) "Preparing to Teach Global Issues" (Roger Cross and Ronald Price); (6) "Introducing Global Thinking in an Elementary School" (Cheryl Garner); (7) "An Investigation of Cooperative Learning and Group Problem Solving Within the Global Thinking Project" (Susan Dunkerly-Kolb, Priscilla Golley, Doug Shook, and Jane Yonts); (8) "Environmental Concerns of Teachers Attending a Global Thinking Teacher Preparation Institute" (Margaret Venable and Julie Weisberg); (9) "Environmental Concerns of Middle Grade Students" (Martha McIlveenne); (10) "Teacher Opinions About the Global Thinking Project" (Wayne Robinson); and (11) "Attitude Survey on Society and Environment" (Simon Vershlovsky). (MDH)

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The Global Thinking Project: Linking Schools in Environmental Understanding

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Preface

Bumper stickers, signs, and headlines exhort us to think globally. But what is thinking globally? How do we teach students to think globally, and empower them to act locally? How does a global computer network empower students to deal with global issues? Can a small group of teachers and educational researchers from the United States and Russia, backed by little other than their shared commitment to caring for the Earth and improving communication between its peoples, create a telecommunications link between students in their two countries and develop a curriculum model for teaching students to think globally?

The Global Thinking Project at Georgia State University is an effort to engage teachers and students in collaborative investigations of their local environments, and in global discussions of environmental issues. We have written and field-tested *Global Thinking: Teacher's Resource Guide*, an interdisciplinary, environmental-science-based curriculum designed to help teachers engage students in a series of "projects" in which environmental issues (such as ozone, water quality, and solid waste) are investigated locally. Students collaborate globally using the EcoNet computer-mediated telecommunications network. At the present time, over 1200 students in grades 5-12 in more than 45 schools in Australia, New Zealand, Russia, Scotland, Spain, and the United States (Georgia, Hawaii, and Vermont) are participating in the project.

In November, 1993, the Global Thinking Project and the Department of Middle Secondary Education and Instructional Technology sponsored a Symposium on Global Thinking Research. The Symposium was held on the campus of Georgia State University. The papers in this collection were presented at the Symposium, along with a video presentation prepared by Roger Cross of La Trobe University, and Paul McColl and Julie Brown of the Greenwood Secondary School, Australia.

Of particular interest to readers should be the papers written by Global Thinking teachers from Australia, Russia, Spain and the United States about how they are using global thinking in their schools. These papers provide insight into the many problems realized by teachers implementing computer-mediated telecommunications projects.

The Symposium was designed to highlight the importance placed on research by the Global Thinking Project, and as a vehicle to provide for dialog on important issues related to this type of reform project.

Priscilla Golley and Jack Hassard

Teaching Students to Think Globally

by Jack Hassard
Georgia State University

Abstract

The Global Thinking Project engages students from different countries in the exploration of global environmental topics by means of a computer-mediated telecommunications network. The project grew out of more than 15 trips to the former Soviet Union sponsored by the Association for Humanistic Psychology beginning in 1983. Through seminars, classroom visits, laboratory demonstrations, and other informal and formal experiences, international agreements were signed between Georgia State University and Russian educational institutions. The goals of the project serve as a vehicle to empower students and teachers in diverse communities to explore new ways to think and learn about themselves and the planet Earth; as well as to identify, explore and take action on real problems and issues. Currently the project brings together nearly 70 teachers and 2500 students from six countries to learn to think globally. Using teaching and learning materials developed by teachers, the participants in the project are joined together by virtue of the following goals:

- To empower students individually and as members of cooperative learning groups to contribute to the understanding and solution of global environmental problems.
- To enable students in different cultures to communicate with each other by means of computer-mediated telecommunications.
- To help students develop the knowledge, skills and effective qualities to take responsible citizenship action on environmental problems and issues.

This paper outlines the history, nature and activities of the Global Thinking Project, and discusses global thinking as a new way of thinking that can serve as a model of learning in classrooms in different cultures.

Teaching Students to Think Globally

Introduction

After an orange cloud---formed as a result of a dust storm over the Sahara and caught up by air currents---reached the Philippines and settled there with rain, I understood that we are all sailing in the same boat.

Vladimir Kovalyonok
Russian Cosmonaut

In September, 1993, ten years had elapsed since the first Association for Humanistic Psychology (AHP) delegation went to the former Soviet Union. Who would have guessed in 1983 that we would come to use the word 'former' when referring to the Soviet Union, and who could have predicted Russian Revolutions in 1991 or 1993?

The early social history of the AHP-Soviet Exchange program was described in the Journal of Humanistic Psychology (Hassard, 1990a). In this paper I will describe the project that emerged from the people-to-people framework we developed. This project started out as an exchange of ideas about how students learn among AHPers, faculty at the Experimental Gymnasium School 710, and researchers at the Institute for General and Educational Psychology. It has evolved into the Global Thinking Project, a computer-mediated telecommunications school project in which students explore global environmental topics.

The Global Thinking Project at Georgia State University is an effort to engage teachers and students in collaborative investigations of their local environments, and in global discussions of environmental issues. We have written and field tested the *Global Thinking: Teacher's Resource Guide* (Hassard and Weisberg, 1992), an interdisciplinary, environmental-science-based curriculum designed to help teachers engage students in a series of "projects" in which environmental issues (such as ozone, water quality, and solid waste) are investigated locally. Students collaborate globally using the computer-mediated telecommunications network of the Institute for Global Communications. At the present time, over 1200 students in grades 5-10 in 43 schools in Georgia (U.S.), Hawaii, Vermont, Australia, New Zealand, Russia, Scotland and Spain are participating in the project. The project organizes an annual Global Summit conference for students and teachers (October), the Global Thinking Teacher Preparation Institute (July), engages graduate students and teachers in educational research projects, and facilitates people-to-people exchanges.

History of the Project

The Global Thinking Project grew out of a series of trips to the (former) Soviet Union sponsored by the Association for Humanistic Psychology (AHP) (Hassard, 1990). With no official invitation, a group of 30 educators and psychologists visited Moscow,

Leningrad (St. Petersburg), and Tbilisi for 17 days in September 1983. Rooted in the concern for the well-being of the planet, and for improving the relationships between the people of the United States and the former Soviet Union, this delegation laid the groundwork for the development of the AHP Soviet Exchange Program. Since 1983, the AHP has sponsored more than 20 delegations to the former repbulics of USSR, and received nearly a dozen delegations of Soviet colleagues. These exchanges fostered official agreements between the USSR Academy of Pedagogical Sciences (now the Russian Academy of Education) and the AHP that focused on humanistic and creative teaching methods, cooperative learning, and teacher education. Through seminars, classroom visits, lab demonstrations, and other informal experiences, a powerful network was established.

Georgia State University (GSU) emerged as the focal point for the AHP's educational activities with the Academy of Pedagogical Sciences (APS). An international conference on Soviet and American education led to an agreement between GSU and the APS that was signed in Moscow in May of 1989. Both parties agreed to collaborate to develop strategies, methods, and teaching materials to help students think globally. Both sides agreed to collaborate to develop teaching materials that would:

1. Empower students and teachers to get involved with important global problems and concerns

2. Introduce students to collaborative methods and strategies of inquiry that can be used to solve problems locally, and provide the knowledge and technological means needed to deal with problems globally

3. Develop computer literacy in students that will allow them to use microcomputers as a telecommunications tool to collaborate with counterparts in other nations.

The Russian Connection

The Global Thinking Project is a grassroots environmental education project conceived in seminar rooms, and classrooms in Moscow, St. Petersburg and Atlanta. The project owes

its existence not only the AHP Soviet Exchange Program, but to the efforts of American and Soviet classroom teachers who were interested in working hand-in-hand to learn about each other, how they taught, and how to improve the quality of learning in their classrooms. As shown in Figure 1, the Global Thinking Project fostered the exchange of people and ideas through a series of meetings, seminars, and social visits. These exchanges established interdependence amongst American and Russian educators, and a way of working with each other which has become fundamental to the nature of the Global Thinking Project. Personal contact, and a deep interest and understanding of each others' professional and personal lives is one of the underpinnings of the project.

Figure 1. Global Thinking Project Timeline

Date	Location	Event
1983 - 1986	Moscow, Leningrad, Tbilisi	AHP Soviet Exchange Program sponsors annual delegations of 30 North American professional psychologists and educators to collaborate with counter-parts in the Soviet Union
1985	Moscow	Gorbachev General Secretary and President of the USSR
October, 1987	Moscow, Tbilisi, Leningrad	5th AHP delegation to USSR. American's taught demonstration lessons at School 710 (Moscow), starting a collaborative relationship with this school to this day.
November, 1988	Moscow, Leningrad	12 member delegation from US received by the USSR Academy of Pedagogical Sciences---laid the groundwork for formal agreement with Georgia State University, AHP and USSR-APS.

December 1988	Atlanta	Delegation of Soviets for two weeks. Wrote draft of agreement with USSR Academy of Pedagogical Sciences in consultation with Y. Koulutkin; first annual conference on Soviet-American Education held at GSU
May, 1989	Moscow, Leningrad	Agreement signed between Academy of Pedagogical Sciences, AHP and GSU; discussions with teachers and researchers in each city.
November, 1989	Moscow, Leningrad	Conference in Leningrad with 12 American educators and 50 Soviet educators. Drafts and outlines of topics for Global Thinking curriculum and collaborative lessons.
July, 1990	Dahlonaga, Georgia	Writing conference creating first version of Global Thinking Teacher's Guide
October, 1990	Atlanta and Jonesboro	Field test of Telecommunications and Global Thinking curriculum between two schools in the Atlanta area
December, 1990	Moscow, Leningrad	Installation of Macintosh computers, printers and modems to establish telecommunications link in five Soviet schools; teacher training seminars in each city for all Soviet pilot teachers.
February - May, 1991	Atlanta, NW Georgia, Pittsburgh, Moscow, Leningrad	Online field test of Global Thinking using AppleLink Telecommunications system

May, 1991	Moscow and Leningrad	Meetings among Soviet teachers and Project Director to discuss field test
August, 1991	Prague	3rd International Conference on Telecommunications. Collaboration with about 50 Russian scientists during the week of the attempted August coup.
October, 1991	Atlanta, Lookout Mountain, Georgia	16 member delegation of Soviet educators (all pilot teachers) meet with American pilot teachers. Retreat seminar in NW Georgia, conference in Atlanta on Global Thinking Project
October, 1991 - April, 1992	Atlanta, NW Georgia, Pittsburgh, Moscow, Leningrad	Field test of Global Thinking using AppleLink Telecommunications System
April, 1992	Moscow, St. Petersburg	Delegation of 16 high school students and 4 teachers from a Global Thinking school (Dunwoody High School, Georgia)
May, 1992	Atlanta	Advisory Board meeting to make recommendations for changes in the curriculum based on field test
June - August, 1992	Atlanta	Revision and writing of the 2nd Edition of the Global Thinking Teachers Resource Guide
September, 1992	Moscow, St. Petersburg	Teacher training sessions with all Russian pilot teachers, meetings with Institute for New Technologies, and Moscow State University

October , 1992	Atlanta	Delegation of 16 high students and 5 teachers from Moscow School N710
October, 1992	Norcross, Georgia (Simpsonwood Conference Center)	Global Summit '92. Conference for all pilot teachers in Georgia (52), student representatives from each Georgia pilot class, and Russian students and teachers from Moscow N710.
October, 1992 - May, 1993	Australia, Georgia (20 schools), Russia (schools in Moscow, St. Petersburg, and Yaroslavl), Spain and New Zealand	Field test of the Global Thinking curriculum using the EcoNet, and affiliated telecommunications systems: Glasnet (Russia), Greennet (Europe), Pegasus (Australia)
January - February, 1993	Moscow, St. Petersburg, Yaroslavl	13 member delegation of pilot teachers and educators to Russia--Global Thinking conferences in each city; research project investigating students' concerns about the environment (simultaneously in Georgia, Barcelona, and Australia
July, 1993	Simpsonwood Conference Center, Norcross, Georgia	First annual Global Thinking Teacher Leadership Institute (22 teachers from Australia, Spain and the US)
September 1993 - May 1994	43 schools from Australia, New Zealand, Russia, Spain, UK, and the US	Schools organized into four Global Communities (of about 10 schools each) to participate in the Global Thinking Project telecommunications curriculum focusing on environmental projects.

November 1993	Atlanta, Georgia (Georgia State University)	Mini-symposium on research on Global Thinking

Linking for Learning

The Global Thinking Project was one of the first efforts by American and Russian teachers to establish telecommunications connections between their students (Hassard and Weisberg, 1992, Berenfeld, 1992). In December 1989, 12 Americans from Georgia transported six Macintosh computers, printers and Hayes modems to Moscow, and over a period of ten days, delivered and set up the computer systems in five Russian schools

(Moscow schools 91, and 710, and St. Petersburg schools 91, 157 and 239) and the USSR Academy of Pedagogical Sciences. Teacher preparation seminars were held in each school to show the teachers how to use the technology, as well as how to implement the Global Thinking curriculum. Using the AppleLink telecommunications system and the SOVAM Teleport in Moscow, telecommunications connections were made among five Russian and six American schools---one in Pittsburgh, three in the Atlanta area, and two in Walker County (Northwest region of Georgia).

During the Winter and Spring of 1990 these eleven schools participated in the first Global Thinking field test. A second field test using the same curriculum materials was conducted during the 1990-1991 school year involving the same schools. The project conducted an evaluation study, had experts in science education, curriculum and environmental science evaluate and make recommendations concerning the project materials, and held a meeting among teachers, scientists and science educators to make suggestions for change (Hassard and Weisberg, 1992). The results of these first efforts to link American and Russian students led to the development of the present Global Thinking Project curriculum framework (Figure 2).

The Barcelona and Melbourne Connections and Beyond

How does a project grow? How should it grow? We have not set out deliberately to involve schools from other regions of the world. However, it has happened. The way the project has grown, and continues to expand is through the process of networking. Two examples will show how this has happened. In February of 1991 I received an email

message from Narcis Vives, a teacher and director of a telmatics project in Barcelona. He said he had learned about the Global Thinking Project from his involvement in another telecommunications project, and since Barcelona and Atlanta were linked via the Olympics, he wondered if we would be interested in some form of collaboration. In May he traveled to Atlanta to visit the project, as well as schools he had made contact with through telecommunications. After visiting some of the project schools, and examining the Global Thinking materials, he suggested that some Barcelona schools join the project for the 1992-1993 school year. Nine schools joined the project.

In October, 1992, Roger Cross, a science education professor at LaTrobe University, Melbourne, Australia joined the faculty at Georgia State University for part of his Sabbatical leave year. I had met Roger two years earlier at the National Science Teachers Association meeting held in Atlanta. While at GSU, he got involved in the Global Thinking Project by working with some of our doctoral students who were beginning research projects on Global Thinking, and by collaborating with us on the Global Summit. At the Global Summit, over 100 Global Thinking students and teachers from Georgia and Russia participated in a two-day conference on the banks of the Chattahoochie River near Atlanta to engage in environmental projects and discussions. While at GSU, he suggested that some schools in Australia and New Zealand might be interested in the project, as well as schools in the U.K. Letters were drafted to schools in these countries, and when Cross returned to Australia, six schools joined the project by February of 1993. One U.K school has joined the project, as well.

As a result of this process, schools in these regions (Barcelona, Australia, Russia) have become empowered to be leaders of Global Thinking in their own right. Cross has made contacts in China, Singapore and India and has encouraged schools there to join the project. Narcis Vives and his colleagues received funding to translate the Global Thinking Teacher's Resource Guide into their native language (Catalan). Vadim Zhudov, director of school 710 in Mocow, and his colleagues made arrangements to translate Global Thinking into Russian and distribute it to all the Russian schools in the project.

In the U.S., the same process is taking hold. Brian Slopey, a teacher in Vermont has taken it upon himself, with the assistance of his colleagues, to join the project, and a group of four schools in the Hilo region of Hawaii have joined. And the connection with

Figure 2 Global Thinking Project Scope and Sequence

Project	Learning Processes	Themes	Objectives	Environmental Education Focus of the Project
Project Hello	Collecting data Communicating Comparing	Energy Systems & Interactions Scale Interdependence	• Map their Global Community • Describe the physical, biological, and geographical characteristics of their environment • Evaluate the environmental quality of their school site	What is our environment like? How does it compare to the environment of other schools?
Project Clean Air	Collecting data Communicating Inferring Applying	Systems & Interactions Patterns of Change Interdependence Energy	• Investigate patterns of atmospheric pollution • Learn techniques to monitor particulates and lower atmospheric ozone • Design a research project based on questions and inquiries about air quality	What do you know about atmospheric pollution? Why is atmospheric monitoring important to our understanding of weather and climate? How does atmospheric pollution (particulate matter and ozone) in our community compare with other communities?
Project Global Thinking	Collecting data Communicating Categorizing Relating	Interdependence Systems & Interactions Scale & Structure Evolution	• Develop an operational definition of global thinking • Understand how living and non living things interact • Discuss the significance of several global environmental problems	What are some global environmental problems facing the Earth? Do students in different regions of the country and the world agree? What are the relationships between Earth's resources and living things?
Project Solid Waste	Collecting data Communicating Categorizing Inferring Applying	Patterns of Change Systems & Interactions Energy Stability Interdependence	• Classify and measure solid waste • Identify ways to reduce solid waste • Determine rates of decomposition of solid waste • Evaluate solid waste disposal methods	Why is it important to study solid waste disposal methods? How is solid waste handled in my community? How long does it take materials to deteriorate? What can be done about the solid waste problem?
Project Water Watch	Collecting data Communicating Ordering Categorizing Inferring Applying	Patterns of Change Systems & Interactions Evolution Energy Interdependence	• Collect data on the physical & chemical characteristics of a river • Collect and identify macroinvertebrates of the river • Analyze the physical, chemical and biological qualities of the river • Learn how to take action to protect bodies of water	Where does our river come from? Where does it go? What are some indicators of water quality (physical, chemical, biological)? What can pH, dissolved oxygen levels, and the types of macroinvertebrates tell us about a rivers' quality? How can we protect bodies of water?
Project Ozone	Collecting data Communicating Inferring Applying	Patterns of Change Systems & Interactions Scale and Structure Energy Interdependence Stability	• Investigate the nature of ozone and how it is formed • Use a variety of methods to monitor tropospheric ozone (ozone test strips, plants, rubber) • Design an investigation of ozone patterns by involving students at other schools	What is ozone? What is the difference between ground level ozone, and the ozone layer? Why is it important to study ozone? How is it formed? How can ozone be monitored? How does ozone affect us? What can be done to reduce ground level ozone? What can be done to protect the ozone layer?
Project Earthmonth	Categorizing Relating Inferring Applying Communicating	Systems & Interactions Patterns of Change Energy Scale and Structure Interdependence	• Identify an environmental problem or issue, and design an action-taking project to help resolve the issue • Participate in action-taking projects designed to focus on environmental issues and problems	What are some environmental problems and issues that are important to our community? How can we find out about these issues? What can we do to help resolve these problems?

the U.C. Davis environmental and mathematics project emerged from the same process. Kurt Kreith and I met in 1991 at Prague at the 3rd Annual Conference on Telecommunications, and since then have communicated via email regarding our mutual interests in fostering connections between East and West, as well as developing in concert with teachers, processes to implement computer-mediated environmental education projects.

The Global Thinking Project

The Context of Reform

Recent efforts to reform the science curriculum have focused on Project 2061: Science for All Americans (AAAS, 1989), and the Project on Scope, Sequence and Coordination (Aldredge, 1992). These reform efforts have been influenced by findings on how students *construct their knowledge* of science and on *cooperative learning*. According to the constructivist model, students "construct" their own meaning and develop concepts through experience and reflection (von Glasersfeld, 1988, Yager, 1992, Shamansky, 1992). One implication of constructivism for the curriculum is more depth and less breadth. Instead of skipping from one topic to another in rapid succession, science teachers would engage students in topics for sufficient time to facilitate the "construction" of knowledge. Cooperative learning fosters the development of communities of student learners organized into small mixed-ability teams to discuss ideas and solve problems (Blosser, 1992, Cohen, 1986, Johnson, Johnson, & Koubleck, 1986, Hassard, 1990b). Problem solving in the context of communities of student learners leads to collaborative inquiry (Rosebery, Warren, and Connant, 1992). Collaborative inquiry has emerged as a powerful model of teaching that envisions students engaged in authentic explorations of science, and teachers assuming the role of facilitator. However, there is evidence that teachers need experience working collaboratively on teams to understand and be able to implement collaborative inquiry projects (Raupp, 1992).

The development of new technologies has also fostered new ways of conceptualizing the teaching of science (Tinker, 1993). One area that has been receiving greater and greater attention has been the use of telecommunications in science teaching to create technology-mediated communities of learning. Projects such as the National Geographic

Society KidsNet (Weir, 1992), TERC's Labnet (Raupp, 1992), and TERC's Global Laboratory (Global Laboratory Project, 1992) use telecomputing and team learning to establish communities of science learners.

While telecommunications can provide a structure for collaboration among teachers and students, teachers need experiences which will help them implement such complex projects (Ruopp, 1992). Very few teachers have had experience using telecommunications, and even fewer have integrated distance-learning into science teaching (Hunter, 1992). A sustained program of teacher education is needed; one which not only provides the technical training teachers need to master telecommunications technology, but also provides ongoing support as they begin to engage their students in telecommunications-mediated collaborative inquiry projects. Ellis (1992) reported that in order for new technologies to be integrated into science instruction, teachers must have access to, know how to, have the skills to, and want to used the proposed new technology in teaching.

GSU has established a leadership institute and implementation program so that middle and high school science, social studies and mathematics teachers and supervisors are able to receive the training and support needed to integrate telecommunications-mediated learning into their schools. Rather than seeing technology-mediated distance learning as a means of delivering content, we have designed a program that connects people (students, teachers, scientists) in the common enterprise of global thinking through the exploration of environmental problems and issues (Brunner, 1992). The project includes an intensive Summer leadership institute, academic-year implementation and support programs, and a world-wide Global Thinking Project telecommunications network established on the Institute for Global Communications (IGC) system. Building on our previous work, we are working towards an ongoing global community of teachers and students who develop the knowledge, skills, affect and behavior to achieve environmental literacy.

The Global Thinking Curriculum

The *Global Thinking Teacher's: Resource Guide* (Hassard and Weisberg, 1993) provides a framework for teachers in different cultures to engage their students in collaborative

research with students in their own as well as other countries. The curriculum consists of a series of the projects in which students learn to monitor important physical and biological aspects of their local environment in order to study such topics as weather and climate change, air pollution, water pollution, acid rain, ozone, solid waste management (see Figure 2). Monitoring is the first step in developing an understanding of global environmental problems. We go beyond this step by providing students with opportunities to apply their "new" knowledge by engaging in cooperative team projects that link students in classrooms globally.

Global Thinking Learning Model. Each project is organized as a learning cycle. We begin by helping students' elicit their *prior experiences* and knowledge, and then engage the students in the *exploration* and *development of concepts* about an environmental topic (air quality, water quality). Finally students apply their knowledge by participating in *action taking* projects. These four stages--eliciting prior knowledge, exploring, developing concepts, and taking action--define the constructivist learning model (see Figure 3) we have used in the development of the Global Thinking "projects." (von Glasersfeld, 1988, Yager, 1992, Shamansky, 1992)

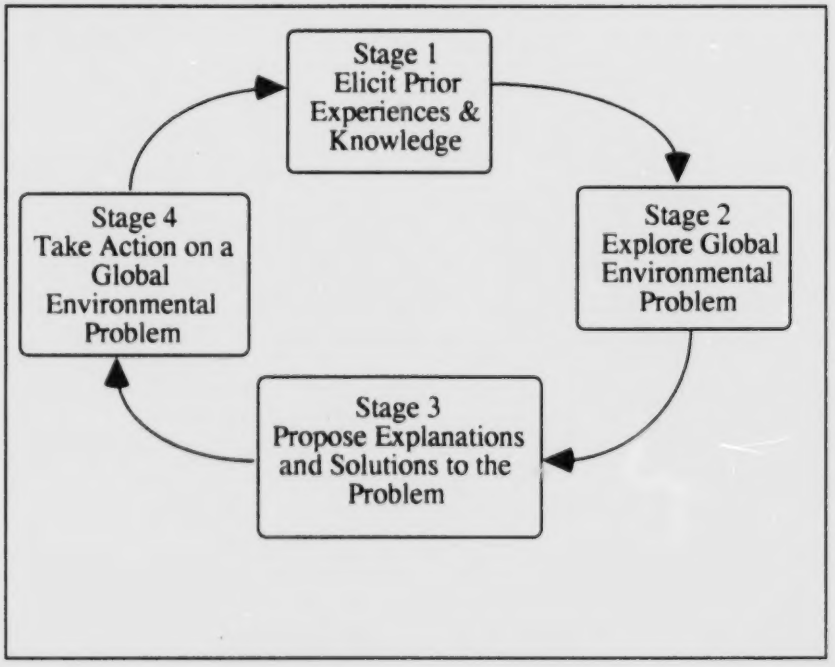

Figure 3. Global Thinking Learning Cycle

Global Thinking "Projects" As shown in Figure 4, the curriculum of the Global Thinking Project is organized into a sequence of "projects." During Phase I, students explore their own environment, gather and share data on environmental problems, and learn how to work together in cooperative teams and how to use telecommunications to collaborate with peers in other schools. During this phase, schools are assigned to a Global Community consisting of eight to ten schools from around the world. Students send and receive electronic messages from all schools in their Global Community, promoting friendship, and facilitating collaboration.

During Phase II, each class selects one project for in-depth investigation. Schools in the Project are re-grouped into communities based on the project selected. These Global Communities, organized on the basis of common interests, work together to investigate environmental problems related to air, water, or land.

During Phase III, the entire Global Thinking Project participates in Project Earthmonth. Students identify and implement local environmental improvement projects, as well as participate in global telecommunications forums.

Phase I*			**Phase II****			**Phase III*****		
Establishing the Global Thinking Community			**Collaborating Globally in Environmental Projects**			**Thinking Locally; Acting Globally**		
September	October	November	December	through	February	March	April	May
Project Hello	Project Clean Air	Project Global Thinking	Choose	from	among Project Solid Waste Project Ozone Project Water Watch	Preparing for--->	Project Earth month	Project Evaluation
*During Phase I, each school will be assigned to a *Global Community* comprised of 8-10 schools. Schools within a Global Community will send electronic mail to each other, as well at to the gtp.earthconf.			**During Phase II, schools will be assigned to either the Solid Waste Group, Ozone Group, or Water Watch Group depending upon the Project each school wishes to study. Electronic mail will be sent among schools within the same Group.			***Schools will continue to work with the Phase II Global Community		

Figure 4. Implementation Plan of the Global Thinking Project

The Global Thinking Telecommunications Network:
A Community of Practice

The development of new technologies has impacted the teaching of science by allowing the creation of technology-mediated communities of science learners. Projects such as the National Geographic Society KidsNet (Weir, 1992), TERC's Labnet (Ruopp, 1992), and TERC's Global Laboratory (Global Laboratory Project, 1992) have demonstrated that it is possible to use telecommunications and team learning to link teachers and students together as they engage in collaborative research projects. Since 1989, we have worked to create a Global Thinking Electronic Community of Practice, which now includes 43 schools in 6 countries.

Global Thinking Project schools in the United States are linked together using the EcoNet telecommunications system, part of the Institute for Global Communications. Schools outside the U.S. are linked with the project by means of affiliated networks such as GlasNet (Russia), GreenNet (Europe) and Pegasus (Australia and New Zealand). We have established three conferences on EcoNet (gtp.earthconf, gtp.teachers, and gtp.scientist), which create electronic environments in which students and teachers can interact publicly with each other. In addition, schools within a Global Community use email to send messages to members of their group.

Schools in the Global Thinking Project use the ALICE Network software developed by TERC. The ALICE software enables students to send reports and data tables across the network. Students also use the software to analyze data, create graphs, and map the results of their work.

Global Thinking---A New Learning Paradigm

A paradigm is a model, pattern or example of one's way of perceiving reality. A number of writers have described the importance of paradigms in determining the way we look at and interpret reality (Kuhn, 1962, Harmon, 1970, Barker, 1992.) Global thinking can be understood, in the context of schooling and learning, if it is viewed as a paradigm shift. The shift is from an old, traditional view of learning, to one that represents new thinking that is synergic and innovative.

What is global thinking? I will try to present an answer to the question by examining global thinking from a number of perspectives including science and the social sciences. The paradigm of global thinking is not new. We shall see that global thinking in the context of schools has roots in the work of such psychologists as Dewey, Rogers, Vygotsky, Piaget and von Glasersfeld. Further we can trace the roots of global thinking to the ideas of such scientists as Einstein, Carson, Vernadsky, and Margolis. Further we shall see that educators such as Springer have examined global thinking in the context of schools, and conclude that the global thinking paradigm calls for the reexamination of educational goals and objectives based on honest answers to the question:

"What does it mean to be well educated in a global society?"

Jerome Bruner provides a cautionary note for educators. Bruner believes that education needs to consider aspects of human wisdom and philosophical depth. Recently, he commented on reform projects in the United States and made the point that "What we need is a reform movement with a better sense of where we are going, with deeper convictions about what kind of people we want to be." (Bruner, 1992, p.6). In this sense, Bruner suggests we ought to think about why we have focused on making education a global playing field in which students in one country are pitted against another. He puts it this way:

> "It might even lead us to question why, for example, we have made such an exclusive fetish about improving our record in science and mathematics rather than, say, concentrating our effort as well on teaching our students about the politics and economics of the revolutionary world changes through which we are living, or about why human nature risks its neck in the interest of freedom in Tianenman Square in Peking, or in East Berlin, in Prague, in Bucharest, in Vilnius. I am not against providing the nation with scientifically and mathematically literate workers so that we can outcompete the Japanese or the new Europe in world markets—*as if that aim alone could ever inspire either teachers or students* (emphasis mine). We forget at our peril that the great leap forward in Eastern Europe and soon, hopefully, in South America and in the Republic of China was led not so much by mathematicians and scientists (although they were there too) but by playwrights, poets, philosophers, and

> even music teachers. What marks a Nelson Mandela or a Vaclav Havel is human wisdom and philosophical depth" (Bruner, 1992, pp. 5-6)

Roots of Global Thinking

Shortly after World War II ended, in May 1946, Albert Einstein wrote a fund-raising letter for the Emergency Committee of Atomic Scientists. He started out his letter by saying:

> Our world faces a crisis as yet unperceived by those possessing the power to make great decisions for good or evil. The unleashed power of the atom has changed everything save our modes of thinking, and thus we drift toward unparalleled catastrophe (Holt, 1984, p.199)

Later in the letter he stated, "We need $200, 000 at once for a nation-wide campaign to inform the American people that *a new type of thinking is essential if mankind is to survive and move toward higher levels*."

Although Einstein didn't say it directly, perhaps he meant systemic or holistic thinking was required if we were to survive. Perhaps the mode Einstein envisioned was global thinking. If we look around at the major environmental problems and issues facing the earth today, most have global causes and effects. Even though problems like ozone depletion, climate change, and acid rain can be traced to actions and activities at the local level (including households), the effects of these problems are global. And indeed the causes can be traced to global systems.

Another scientists, but living in a different culture, who recognized the need for a new way of thinking was the Russian scientist Andrei Sakharov. In 1962, Sakharov advised the Soviet government that atmospheric testing of nuclear weapons should be banned. Although Sakharov wasn't successful at first in convincing his government, his dissident views eventually led to the banning of atmospheric testing, thereby protecting the planet from the effects of nuclear fallout.

About the same time that Sakharov began to speak out about nuclear testing in the atmosphere, Rachel Carson warned all citizens that living things faced disaster and that a "silent spring" might occur. Her book by that title succinctly described the global links in the biosphere, and deadly effects of some chemical sprays (especially DDT) on the pyramid of life. Carson's book led to legislation in the U.S. Congress that eventually put some controls on the use of certain chemicals for the control of "weeds" and "pests." Rachel Carson helped the ordinary person understand the interdependence among living things from the tiniest plankton to the largest of whales, thereby setting in motion the beginnings of the environmental movement that was given impetus later by the first Earthday in 1970, and more recently marked by the Earth Summit in Rio de Janeiro in 1992.

That Global thinking stimulates an awareness of the planet Earth was surely manifested when pictures were sent back to Earth by Apollo astronauts giving single-celled picture of Earth. Looking back toward Earth, astronauts and cosmonauts saw at once that the Earth was whole. Yet this new awareness was more than a visual picture of the Earth, it led to something more powerful. Global awareness implies that things are connected, that the atmosphere over Toledo, Ohio can affect the trees in Canada, that clear cutting the forests of Brazil could change the temperature of Moscow, and recycling newspapers could reduce the chances of oil spills.

And just as the space age has given us new visual images of Earth, it has led to new questions and theories. One of the scientists to work on the Martian project that looked for signs of life on the "red planet" was James Lovelock. Lovelock and his colleagues on the Martian project devised a number of "life-detection" experiments. One of their suggestions was that a planet bearing life might have an unexpected mix of gases in its atmosphere if life's chemistry were at work. Dr. Norman Myers, editor of GAIA: An Atlas of Planetary Management, describes Lovelock's breakthrough this way:

> When they looked at Earth in this light (having an unexpected mix of gases), their predictions were borne out with a vengeance. Earth's mix of gases, and temperature, were hugely different from what they predicted for a "nonliving" Earth, as well as from neighboring planets. The fact that these conditions appeared to have arisen

and persisted alongside life led to the Gaia hypothesis---the proposal that the biosphere, like a living organism, operates its own "life-support" systems through natural mechanisms.

What Lovelock and microbiologist Lynn Margolis, co-author of the Gaia hypothesis, suggested was that the earth's atmosphere was not simply a product of the biosphere but was a "biological construction---like a cat's fur, or a bird's feathers; an extension of a living system, designed to maintain a chosen environment" (Lovelock and Margulis, 1984).

The Gaia hypothesis is a useful concept to help students think about the interrelationship of Earth's basic resources---energy, water, air, and climates (Lovelock, 1988). According to the Gaia hypothesis these elemental resources can be radically affected by changes in any one of them. Many of the projects in the Global Thinking curriculum focus on these elemental resources, and enable students to get involved by monitoring them, asking questions about them, and conducting projects to find out more about them. It also should be pointed out that the management of these elemental resources is what many environmental action groups advocate. Global awareness and the Gaia hypothesis support a new way of reasoning about the earth, its environment, and inhabitants (all living things), namely global thinking.

Space age explorers were not the first to think of the Earth in this way. A Scottish scientist, James Hutton (a geologist) proposed in 1785 that the Earth was a living super organism. He actually suggested that the science of the Earth should be physiology! It 's odd that the "father of geology" would perceive the solid Earth as a living organism.

Another scientist that viewed the Earth as alive planet was Vladimir Iranovitch Vernadsky, a famous Russian scientist (1863 - 1945). Vernadsky, perhaps as much as anyone, laid the foundation for global thinking. Vernadsky is credited by inventing several fields of science, each of which was characterized by interdisciplinary study. For example, one field he suggested was biogeochemistry, literally the integration of biology, geology, and chemistry (Lapo, 1982).

But perhaps more pertinent to global thinking is the fact that Vernadsky coined the concept of "biosphere." He encouraged scientists to focus their attention on the "sphere of life." According to Vernadsky the so called living and nonliving parts of the Earth were interdependent and tied to each other. In fact Vernadsky called life a "disperse of rock." To him life was a chemical process in which rock was transformed into active living matter and back, breaking it up, and moving it about in a never ending cyclic process.

Learning to Think Globally

Two main concepts underlie the paradigm of global thinking:

- Anticipation
- Participation

Anticipation in learning is the capacity to face new situations. It is the ability to deal with the future, to predict coming events, and understand the consequences of current and future actions. Anticipation also implies "inventing" future scenarios, and developing the philosophy that humankind can influence future events.

Participation, on the other hand, is the complimentary side of anticipation. Students must participate directly in learning. The learning model that underlies global thinking is based on the following constructivist ideas (von Glasersfeld, 1988)

- knowledge is not passively received but actively constructed by the student.
- the function of cognition is adaptive and it organizes the experiential world.

Participation has local and global components. Action locally is based on a view of environmental education which is described as "education for the environment" (Figure 6). In this view students not only become knowledgeable about the environment, but aware of environmental problems, how to solve them, and motivated to work toward their solution (Michel, 1993). The design of learning experiences, described earlier, includes an action-taking component that is fundamental to the idea of participation. The other component of participation is global. The use of telecommunications enables students to

extend participation beyond their own communities. 'Telecommunications sets up cross-cultural partnerships, global communities, and global summits for studying common global concerns. Springer suggests that telecommunications used for dialog with peers on the other side of the globe is based on the work of the Russian psychologist Vygotsky. Vygotsky viewed knowledge being constructed in a social context, with student's ideas being influenced by the ideas and interactions with others (Springer, 1993).

The global problems that students explore in environmental education (air pollution, acid rain, solid waste management, water pollution, ozone) have local causes. Because of this, students should be involved not only in learning about them, but participating in solutions to them as well. This is accomplished by participating in hands-on activities in which they pose questions, gather and analyze their own data, and take-action on their findings.

A quote from the book, *No Limits to Learning* provides further insight to the concept of participation:

> Participation in relation to global issues necessarily implies several simultaneous levels. On the one hand, the battleground of global issues is local. It is in the rice fields and irrigation ditches, in the shortages of over-abundance of food, in the school on the corner and the initiation rites to adulthood. It is in the totality of personal and social life-patterns. Thus participation is necessarily anchored in the local setting. Yet it cannot be confined to localities. Preservation of the ecological and cultural heritage of humanity, resolution of energy and food problems, and national and international decisions about other great world issues all necessitate an understanding of the behaviour of large systems whose complexity requires far greater competence than we now possess. The need to develop greater competence and to take new initiatives is pressing. For example, during times of danger or after a natural catastrophe, nearly everyone participates. Can we not learn to participate constructively when animated by a vision of the common good rather than a vision of the common danger? (Botkin, 1979, p.199)

A Paradigm Shift

Global thinking is a new pattern of thinking. It represents a shift in thinking from an old, traditional model to a new, and flexible model (Figure 5). In the old view, thinking was mechanized and individualistic based on an industrial model, whereas global thinking is relativistic, interdependent and cooperative based on an innovative model.

The Traditional Model	The Global Thinking Model
• Traditional, mechanized thinking	• Innovative, flexible thinking
• Individualistic--although students may at times work together in groups, interdependence typically is not a goal.	• Cooperative--students work collaboratively in small teams to think and take-action together
• Dependence--teacher-directed instructional model establishes a dependent social system.	• Interdependence--a synergic system is established in groups within a classroom, and within global communities of practice.
• Hierarchical---choice-made-for-you. Rarely do students choose content or methodology for their investigations	• Right-to-choose---students are involved in choice-making including problem and topic selection, as well as solutions; reflects the action processes of grassroots organizations
• Emphasis on literacy: knowing facts, skills, concepts	• A new literacy insofar as "knowledge" relates to human needs, the needs of the environment and the social needs of the earth's population and other living species
• Emphasis on content; acquiring the right body of knowledge	• Emphasis on anticipation and participation; on inquiry, learning how to learn, and how to ask questions
• Learning encourages recall, and is analytical and linear	• Learning encourages creative thinking, and is holistic and intuitive

Figure 5: The Paradigm Shift from the Traditional (Old) Model to the Global Thinking Model (New)

This new model of thinking has implications for schools. In the old model, school objectives and curriculum were driven by subject specific disciplines. Courses and programs were organized to teach students about the subject, e.g. science, history, geography, mathematics. The new model suggests a different way of organizing courses, and expereiences. Springer (1993) suggests that:

> Global thinking takes direction from societal concerns rather than from the inward structure of traditional education. Global thinking means looking at the process of schooling differently, considering what it means to be well educated in a global society. Global Thinking presents man as a constructivist, a social scientist capable

> of using a wide range of scientific attitude skills to develop theories for inventing the future and affecting change. Applying the anticipatory/participation model, global thinking facilitates interactions, connections and partnerships that allow students to experience the social nature of knowledge (Springer, p.79).

A number of themes emerge as organizing principles for global thinking. Springer (1993) presents a model of global thinking that emphasizes two themes:

- Interdependence
- Right-to-choose

She sees global thinking as a means of helping students accommodate to the rapid globalization of the world by becoming aware of and acting on the themes of interdependence and right-to-choose. Interdependence requires action on the part of the student. Understanding interdependence must go beyond the definition, and be based on real work by the students. Providing experiences in which students learn about interconnections among global problems is essential. Collaborating on cooperative projects with students in other cultures is one example of how to "teach" interdependence.

As Springer points out, "the right-to-choose" metaphor has emerged around the world as people have demanded the right to participate in all aspects of their lives. Of importance here, is the fact that grassroots movements have had powerful impacts on how people think about change. As people have realized how powerful their images of reality are, they have demanded the right-to-choose. This notion has a profound affect on the decisions that are made about how and what to teach. Providing students opportunities to enact their ideas to solve problems, indeed to select the problems they wish to investigate is in sync with global thinking.

Relationship of Global Thinking to Environmental Education

Environmental education has had a close association with progressive and "new" methods of teaching and learning. Dewey emphasized the importance and value of involving students in the exploration of the environment. Yet environmental education has played a minor role in the curriculum not only in the United States, but in many other countries as

well (Hassard, 1992). How should environmental education be viewed in the context of global thinking?

International views of environmental education. International organizations such as the United Nations and the World Bank have convened conferences on environmental education and have defined the nature of environmental education, and courses of action that the nations of the world must take to establish sustainable living environments---in particular, the Belgrade Charter (1976), the Tbilisi Conference (1979), and the UN Conference on the Environment in Rio de Jinero (1992). The environment is a concern of developed and developing nations, and student involvement in investigating and exploring environmental education should be of paramont value in the goals and objectives of each nations' educational system. However, the approach to presenting environmental education should not be based on the old model of thinking, but should incorporate to the extent possible, the model of global thinking.

The paradigm of global thinking presented here has emphasized active learning in which students apply the anticipatory/participatory model of learning. Further, students should have opportunities to engage in action-taking environmental projects. Of particular interest is the agreement by educators from many nations on a general approach and philosophy embodied in the Belgrade Charter.

Education *about, in* and *for* the Environment. Michel (1993) described an analysis devised by Lucas to classify environmental education into three groupings, education about, in and for the environment (Figure 6).

Education about the environment is viewed as an approach in which information about the environment (concepts, facts, information) is transmitted by teacher to students. This approach reinforces traditional methods of teaching including lectures, reconstructive laboratory activities, and the recall of information. It is based on the older, traditional model of teaching.

Education in the environment focuses on using the environment as the medium for teaching and learning. Michel points out that this form of environmental education

emphases experiential learning, and that experiences in the environment aids personal growth and moral development. Student projects tend to fall into a safe zone such as anti-littering campaigns.

Education for the environment, according to Michel (1993), evolved from conservation education which focused on the preservation of basic resources and nature conservancy. This concept of environmental education expanded to include environmental protection, and the role that citizens began to take action (individually and collectively) in the solution of environmental problems. Michel claims that education for the environment could be interpreted as a response to the perceived environmental crisis. Michel also points out that education for the environment is the approach advocated by several international proposals including the Belgrade Charter (1976) and the Tbilisi Declaration (1978).

Education *about* the Environment	Education *for* the Environment
• Reproductive curriculum	• Reconstructive curriculum
• Predominately an emphasis on the sciences	• Predominately an emphasis on social science
• Employment of "traditional" teaching methods (lecture, recall, worksheets)	• Advocation of student-centered approach with emphasis on inquiry and problem solving.
• Emphasis on cognitive skills	• Emphasis on awareness, values, and attitudes as well as skills and knowledge. Advocation of practical action in the environment.
• Operates within the existing hierarchical, subject specific school organization	• Interdisciplinary approach

Figure 6. Comparison of Education About the Environment with Education for the Environment (Michel, 1993, p. 11).

The education for the environment requires an innovative model to teaching (Figure 5). Furthermore, it complements the global thinking paradigm. In this view, students should be involved not only in learning about the environment, but "be provided with the knowledge, values, attitudes and commitment and skills needed to protect and improve the environment (Tibilisi Declaration, 1978, p.3, as cited in Michel, 1993).

Students' Concerns About the Environment. If we rely on the old model presented here, we can find in the literature reports that claim that students posses misunderstandings about global problems---most do not know, for example that the automobile is the major source of air pollution in urban areas, that plastics and synthetic fibers are made of oil, or how acid rain is formed. (Mullis and Jenkins, 1988) But if we look further, we also find evidence that although students do not feel empowered to apply knowledge to solve global problems, they thought they could help, and they were willing to do so. (Bybee, 1984).

Students are concerned about the environment, and not only want to be involved in contributing to the solution of environmental problems, but agree that people in general (including themselves) should take action (McIlveene, 1993). In McIlveene's study (1993), students in Australia, Russia, Spain and the United States were surveyed and asked "Based on your opinion, what are four concerns about the environment that are most important to you." The students in the study identified more than 20 different concerns, and identified most often air pollution, water pollution, deforestation, ozone depletion, and the extinction of species. These concerns students identified were not different from concerns that scientists and science educators indentified in a study by Bybee (1984). When they were asked "How they first came to learn about each of the four environmental concerns," they responded with television, and other mass media sources as the way they learned about the environment. School was rarely mentioned. And when asked "Who do you think is responsible for solving each of your concerns," they identified themselves (often expressed as everyone, people, us) as the ones responsible.

The inclusion of environmental education programs into schools based on the principles of global thinking is a challenge for educators in all countries. A whole-earth agenda of global concerns faces the citizenry of the world, and students, as future citizens, need to be empowered to deal with them.

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Introducing Global Thinking to Students in an Australian Secondary School

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The Global Thinking Project (GTP) started in use during the 1993 school year (that is, in February). One class group of year 9 students was chosen, that year level being the one at which there were already some environmentally oriented topics. The nature of the curriculum materials suggested that the project would be of some relevance to English, science and geography subjects. The GTP coordinator (Paul McColl) was allocated to teach only mathematics at year 9 level in 1993. So, with the four subject areas, there were four teachers associated with the GTP program. The College's Curriculum Committee and the School Council were both supportive of the project and funds were set aside, mainly for the costs associated with the use of the computer link.

Initially, the staff and students were enthusiastic about the venture. Detailed plans were drawn up requiring the teachers to be in regular contact with each other to ensure continuity of development. Administrative and technical delays outside our control delayed the installation of a readily accessible modem for about six weeks. However, during this time, there was one modem located in the administrative area that could be used intermittently for staff to familiarize themselves with the communications package. This delay seemed to result in a significant decrease in student enthusiasm. There was a revival of interest when contact with Bosnia was established during an early GTP session, but this enthusiasm did not reach the earlier euphoric levels. Teachers' lack of familiarity with the content and implementation of the materials probably limited the success of the pilot stage of the project. Nevertheless, this first encounter was a valuable learning experience for staff, and there was frequent discussion of progress, problems and ideas for improvement.

Two of the most significant challenges are:

- the lack of "personal" contact between schools resulting from simply putting

information into a computer.

- the lack of purpose associated with the messages and information uploaded, this being a problem particularly for "sending" schools who didn't necessarily know whether anyone read their messages or not.

The former issue has been addressed in two ways in the revised curriculum package:

1. The grouping of schools into smaller Global Communities, making more specific contact possible, and the suggestions for exchange of letters, souvenirs and items of local interest, via "snail mail" between schools.
2. Designing individual activities in each project:. There are suggestions for writing comparative reports using information from different schools and for the exchange of those reports.

Southern hemisphere schools experienced some administrative difficulties in matching their programs with the northern hemisphere because of the different starting times of their respective educational years. To maintain simultaneity of activities with the northern hemisphere we must begin the program in the last months of one school year (October and November, mainly), and pick it up again some six to eight weeks later in the new school (and calendar) year. Apart from the time discontinuity, it is also highly likely that many teachers will change groups in the new school year. The alternative of beginning the program at the start of the school year is no more palatable because student introductions in Project Hello would be well out of synchronization, and we would only just be catching up when the northern hemisphere schools were about to wind down for the end of their school year.

Australian schools have begun the 1993/94 program. At Greenwood, we are now involving all class groups of year 8 (year 9 in '94) students. This amounts to about 110 students in five class groups. Coordination of the program will be somewhat time-consuming with up to fifteen teachers being involved and computer usage to be supervised. Different schools naturally have computing arrangements. We do not have ready access to a classroom of computers in the science area, and so classes have to be

scheduled into the computer rooms elsewhere in the school for typing of messages. The floppy disks must then be taken to the library computer where the modem is located.

Enthusiasm among the groups who have already started at Greenwood is high beyond our expectations at this stage! This seems partly due to a more enthusiastic bunch of students, partly because of the learning experience in the first half of 1993, and partly because of the improvements made to the materials themselves (especially the "snail mail" packages, which we had already begun to receive before our students started). The enthusiasm of the staff has also been a significant factor in the early success of the program so far this year, in particular the work done by Julie Brown in designing detailed class activities for the teachers new to the program. These activities have ensured a great start for our first year of full involvement.

The Global Thinking Project in Catalunya (Barcelona)

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Narcis Vives and Anna Pinero are the co-coordinators of the Global Thinking Project in Barcelona, Spain. Narcis visited Atlanta in 1992 and after his visit organized the teachers in Barcelona to participate in the Global Thinking Project. Anna Pinero represented the Barcelona teachers at the Global Thinking Project Summer Institute in 1993.

This year in Catalunya, nine schools are working on the Global Thinking Project (GTP). Last year, which was the first year we participated, five schools took part. Recently, we began to work on the first activity, entitled "HELLO." Before starting to work with the students, the two Spanish coordinators held a meeting with the other Barcelona teachers who would work alongside the students in the GTP. Our goal was to introduce the teachers to the constructivist methodology and also the teachers role in the classroom. Similarly, the teachers were informed of the different activities and the timetable for sending their Global Community reports. The teachers who are participating in this project hold meetings every month, in order to explain our difficulties, our experiences, and our suggestions. It is not easy for us to give the initiative to our pupils, and play our correct roles.

The nine schools that participate in the Project are very different. Four of public schools, two are private schools, one depends on the council, and two are catholic schools. Seven of them are situated in Barcelona, one in a nearby town, and another is a rural school. All the schools have a computer-room, and some of them have computers in the class-room--especially for the younger children.

The majority of the schools have participated in other telecommunication projects, but this project is the first which offers us a special form to work with our pupils. Teachers have valued cooperative learning very much.

Cooperative Learning

We began to work with our students in the middle of September. We started by dividing up our students into small groups. The majority of the schools have thirty pupils in each class, so we are working with six or seven groups per class. The children were very surprised when they discovered their responsibilities, and, at times, found it difficult to accept them. A lot of times students did work which is not their responsibility. They also forgot that only one member of a group may ask a question. This, sometimes led to confusion. In every group there were some students who know more than others about computers.

More examples of what happened every day when we were working was a lack of importance that they gave to the roles of communicator or facilitator. It was very important for us to explain to our students that in each group all the responsibilities have importance, and are necessary to obtain a successful result. The word "cooperative" is understood with difficulty, because some of our pupils like always to be "leaders", and other students believe that their opinion doesn't interest anybody. Teachers have observed that students searching for information often discover corners of the library, previously thought not to exist.

In Lavinia School, and in other schools, we are working on the second activity of Project Hello, and some students have difficulties in finding the material that they need. For example, a student was searching for the name of the street that the school is on, and she didn't remember that she could look up a list of streets because they are ordered alphabetically. She tried to find the street by looking at the different maps. The teachers also observed that students had problems using the knowledge they already had about a topic. They liked to think about new things, but they believed that they don't know anything when they began to work on a new topic.

The Problem of Language

Here in Catalunya we have a problem with this project. That is the language. Our students usually speak in Catalan, and at school the books are also in Catalan. They speak Spanish, but for the majority of our pupils Spanish is their second language. For this reason, English is for them their third language. It is a problem, because they must understand the messages that they receive, and they try to write in English, while other schools will write their messages in Spanish. The short time we have doesn't always allow us to work completely in English since the science teachers often don't understand English and they must work with the English teacher. In all the schools where the English teachers collaborate, we can observe that the students use the dictionary more, and they try to improve their level of English, because they want the other students to understand their messages.

All the pupils have a high interest, in knowing something about the students from other countries; they wait very anxiously for the telecommunications messages.

Global Thinking in an American Middle School

by Sarah Crim
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Sarah Crim has been involved as a pilot teacher from the very beginning of the Global Thinking Project. She has been appointed to facilitate and coordinate the travel of foreign Global Thinking teachers to the US during the Summer Institute programs.

I began with the Global Thinking Project when only six schools were involved. Three of the schools were American schools and the other three schools were Russian. The project now includes schools from several foreign countries in addition to about twenty schools from the United States.

The Global Thinking Project has been very rewarding for me and my students. It has helped us to appreciate view points that are not always the same as ours. It has made us aware that being different is not bad, and has helped us to accept differences.

The Global Thinking Project is part of one of my seventh grade life science classes. During my first year in the project, I selected the students myself. My only criteria was that the children to be able to work together and help each other. After that year, students have applied to be in the class. The original criterion is used in selection of new project participants.

Students' lives have been changed and, I believe, some parent's attitudes toward others have changed. Students from backgrounds with limited cultural exposure have experienced friendships they would never have had if it were not for The Global Thinking Project.

The Global Thinking Project has benefited my seventh grade students. The seventh graders are always eager to learn and help in things they feel are important. They want our world to survive and be healthy and happy. Finding out about environmental and

political issues has been very important in giving them a feeling that they can do something positive. They have learned to stand up for the causes they think are important and they have begun to realize that what they think does count.

These students have adopted whales, bought acres of rain forest, spoken out against people wanting to harm their land, helped in cleaning and beautifying our school, and have gathered food and clothing for the homeless in Chattanooga. I'm sure all of this positive activity has carried over into their homes.

The Global Thinking Project is really a way to encourage personal growth in students and teachers. To me, it is a very special program. My students and I have learned to think globally.

Preparing to Teach Global Issues

by Roger Cross and Ronald Price
La Trobe University, Australia.

What we Advocate:

The Global Thinking Project provides us with an opportunity to trial, in a supportive environment, ways of reconstructing our teaching so that it becomes more socially responsible. This requires changes in both the content and methods of teaching. You will become familiar with the cooperative learning method of teaching by being a part of The Global Thinking Project. We would like to share with you a method for developing global thinking content issues. This method involves helping students develop the skills they will need as future citizens. The skills they will need to participate rationally in developing a more sustainable world. We believe the skills include:

1. understanding the arguments surrounding the issue;
2. judging experts' decisions;
3. carrying out independent investigations using the literature and in the field;
4. acquiring a knowledge of, and ability to participate in, democratic ways of influencing decisions (Cross & Price,1992).

We are very mindful of the difficulty of identifying the controversial and gathering evidence when what our sources present us with is nearly always 'a rhetoric of conclusions' (Schwab, 1963). However, we believe that such a procedure is not only a necessary step in preparing to teach a unit of work, but that it can lead us to an understanding of the broader changes which will be necessary if our teaching is to become more widely recognized as a valued component of a democratic education.

The essence of our procedure is the examination of the selected Global issue or topic to determine what are the knowledge and skills which will enable the students to make their own judgments. We believe that only after we teachers have sorted out the questions involved in the particular issue and run through the major arguments can we be in a position to decide on how to present the issue. It is not intended that we impose our findings on the students, but rather to help our students identify ways in which they can

learn what they will need to make informed judgments. What follows is a procedure to aid you in the development of teaching materials for the many controversial issues, including the Global Thinking Project topics.

Our procedure consists of the following steps:

1. **Defining the Projects:** The kind of social issues which are likely topics are usually too broad to be successfully handled as a single project. It is therefore desirable to begin by considering how they might be broken up into separate projects. You must also decide whether to select only one of these projects for detailed examination or whether to allot different projects to different groups of students within the class.

2. **Sorting the Questions:** This step involves brain-storming the questions involved in the selected project (ionizing radiation; water pollution; genetic diversity) and then grouping and sorting them. They need to be sorted in various ways: according to discipline type: ethical, political, economic, scientific, etc., and according to whether the answers are known or disputed. Decisions must be made as to which questions are too difficult to handle, and which will be of the most educational benefit.

3. **Handling the Arguments:** This is a particularly crucial step, involving setting out and analyzing the steps of arguments to answer the selected questions. Some questions that might be asked to begin this process are:

- what kind of evidence is involved (e.g. chemical, statistical)?
- are there problems of terminology, conceptualization or logic?
- what prior knowledge or skills are required of the students?

The last question leads to a choice of teaching methods, but we see **Handling the Arguments** as a prior step.

When handling the socio-political and economic aspects of a question, an important consideration will be the identification of the various interest groups ('stakeholders') involved. In addition, there are questions of values. During a Global Thinking class students may bring up other arguments which you may not have anticipated. They

should then be encouraged to follow a similar process of setting the argument out and analyzing the steps.

4. **Considering the Consequences**: Students appear to find this a very difficult task, often failing to understand that a concept is simply the meaning of a term. Understanding of the concept may or may not require an unfamiliar word (table does not, metabolism probably does), but certainly requires definition.

In handling an issue it is necessary to consider what is the minimum list of essential concepts and which, if any, are likely to give difficulty. Consideration of how to handle that difficulty should also occur prior to the teaching event. Drawing concept maps can help develop understanding of the ways in which concepts are linked together.

5. **Particular Teaching Methods:** Once the previous steps have been completed you will be able to prepare a unit plan using cooperative learning as your key teaching method.

6. **Resources**: These will probably always be a difficulty, although we are lucky to have the Global Thinking Handbook. This is in part because a good issue is controversial and many of the resources will be partisan and in part because we will want to use up-to-date and therefore scattered materials. The materials often pose difficulties of language and style and too often lack details of the evidence required for successful learning of the skills of evaluation. Perhaps we can begin to share suitable materials within our global community, and identify places where our students can locate local resources (local interest groups, libraries, government offices).

Having completed these steps you will be in a position to quickly develop the project into a unit of lessons suited to your particular class. Many of the activities which you will have already performed will be repeated by your students in the course of the unit (brain-storming questions, concept mapping, evaluating resources), but the confidence gained from your preparation will enable you to encourage a wide-ranging exploration of the issue.

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Introducing Global Thinking in an Elementary School

by Cheryl Garner
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USA

Cheryl Garner, in addition to being a pilot teacher, is a member of the Global Thinking Teacher Preparation Summer Institute staff.

This is our schools second year in the Global Thinking Project. I teach in the elementary gifted program, which is a pull-out resource classroom in our school system. It is an ungraded program. We teach interdisciplinary, teacher-made units, and do not teach from textbooks. The units I teach yearly draw heavily on science, social studies and computers. I find that these subject areas mesh well with the Global Thinking Project.

I integrate Global Thinking into my other units by trying to make Global Thinking modules "dovetail" my teacher-made units. I understand the Global Thinking Teacher's Resource Guide and the Global Thinking processes better this year. Our forth and sixth grade class of thirteen students (the Global Thinking group) only meets two times a week for a three-hour period on Mondays and a one-hour period on Tuesdays, so continuity with Global Thinking (and other studies) is a problem.

We began our experience as a Global Thinking classroom at North Heights last October. This was directly after meeting with experienced Global Thinking students and teachers at Simpsonwood Conference Center. We concluded last years' Global Thinking with an effort to help Camp Veli Joze (a refugee camp in Bosnia). Students planned and executed activities to raise 343 dollars.

From this teacher's viewpoint, Global Thinking fosters many valuable skills. The Global Thinking Project requires the use of technology, the development of computer literacy, writing and creative thinking skills, problem-solving skills, a curiosity about cultural geography, a greater awareness of world cultures (and awareness of similar needs and problems world-wide), and keeping abreast of current ecological problems.

My students have responded positively to the project. But, as with any group, kids expressed a variety of opinions. I gave them a simple rating scale from 1-5 to rate how well they liked the Global Thinking Project (1 being lowest, and 5 the highest ranking). The average rating was 3 for the entire group. Fifth graders gave more five's; 6th graders gave lower ratings. Some students thought Global Thinking took up too much time in Challenge (the gifted program); others did not and were eager to do more. Two students found the uploading and downloading on the computers too repetitive; others jumped at the chance to perform the computer tasks involved.

What are the students learning? Here are some responses by some of the students in my class. Jessie, Patrick, Lydia and Leigh: reported that some of the knowledge gained helps in other classes, because it is so much more current than textbook information. They learned that you can communicate as easily with someone in another country as you can with someone nearby. They appreciated the value of learning about other countries first-hand. Anne and Jamie mentioned the value of cooperative learning and working in groups. Andrew and Kevin: said that they have learned different uses of computers and modern technology. They felt that the project let them learn in the "here and now."

My students may start to see connections between one country's needs, and uses of certain natural resources, and the exploitation of resources due to modern civilization. Examples of such inverse relationships are the destruction of rain forests in Central and South America, wide-spread problems with acid rain, and chemical causes of cancer. Fascinating newspaper articles relating the story of pollution in Siberia, due to platinum smelting for catalytic converters on American cars, were used in class as part of Global Thinking. Global Thinking has opened many doors for reflective and critical thinking for our class at North Heights.

An Investigation of Cooperative Learning and Group Problem Solving Within the Global Thinking Project

by Susan Dunkerly-Kolb
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Doug Shook
Summerour Middle School

and

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Fairyland School

Statement of the Problem

> "The Global Thinking Problem was born out of a desire to help overcome misunderstandings between communities, and to promote cooperation between people living in different circumstances. It seems to promote an appreciation of the needs and difficulties of others."
>
> "The rationale has, as its underpinning, a belief that schooling can act as a catalyst in society for change. Here change means more than understanding, the circumstances in which people live, and different people's views about important Global issues, it means a realization that we are all responsible for the fate of the life on earth, and that the 'health' of the planet is in all of our hands" (Hassard,J. & Cross, R., 1993)

The Global Thinking Project provides a framework for teachers in different cultures to engage their students in collaborative research and problem solving with students in their own as well as other countries. The curriculum consists of a series of projects in which students learn to monitor important physical and biological aspects of their local environment in order to study topics such as weather and climate change, air pollution, water pollution, ozone, and solid waste management.

The project has incorporated principles of constructivism (von Glasersfeld, 1988) and cooperative learning (Johnson, Johnson & Holubec, 1987) into the design of the global thinking curriculum. According to the constructivist model, students "construct" their own meaning and develop concepts through experience and reflection (von Glasersfeld, 1988, Yager, 1992, Shamansky, 1992). Each "project" begins with activities which elicit students' prior experiences and knowledge, and then engages the students in the exploration and development of concepts about an environmental topic. Finally, students apply their knowledge in a a problem solving experience by designing and participating in action-taking projects.

This study is designed to explore one of the major goals of the Global Thinking Project, namely to introduce students to collaborative methods and strategies of inquiry that can be used to solve problems locally, and to provide the knowledge, and technological means to deal with problems globally (Hassard & Cross, 1993).

Three major questions will guide researchers in this investigation:

1. How does group problem-solving change as a result or participation in the Global Thinking Unit?
2. To what extent do the students exhibit attainment of the overarching outcomes of Global Thinking in the context of a problem-solving task?
3. What are the factors that influence the way students work in groups to solve the Global Thinking problem task?

In addition to the major questions, related questions will also be explored:

4. What are students verbal and non-verbal behaviors in groups and what is their relationship to problem-solving success?
5. What kinds of questions do students ask in group problem-solving sessions?
6. Which students provided the most input in problem solving?
7. What was the students' assessment of the cooperative learning experience?
8. What was the teachers' assessment of the the students' problem-solving experience?
9. How does their role within the group affect students' participation in the group?
10. How do students reflect on their own thinking within the context of group problem-solving?

Preliminary Review of the Literature

Introduction

The purpose of this review of the literature is to provide background for a study involving group problem solving within the context of the Global Thinking Project. Reasons for the choice of cooperative grouping, as the model for group learning, will first be examined. This section will begin with the conditions necessary for the facilitation of group problem solving and end with a listing of the components of cooperative learning which allow it to meet these conditions. Second, cooperative grouping within the Global Thinking Project will be examined from the perspective of the generative model of anticipation/participation. It is within this model that the creators and facilitators of the project hypothesize that cooperative learning will empower students to begin to think globally.

Conditions Facilitating Group Problem Solving

Research based on the social learning theories of Piaget and Vygotsky indicates that the interaction of students with teachers and peers facilitates learning. When students compare their ideas with those of their teachers and peers, they must make them explicit to themselves before they can convey them to others. Comparison of their ideas with those of others who may take a different view may compel the students to take on a different perspective. Feedback from others can result in new ways of looking at problems and others like them which may be encountered in the future.

Using this information, educators have attempted to put students together in such a way as to facilitate the learning indicated by these theories. However, simply placing students in groups and expecting them to work together to solve problems without any prior intervention has not been found to be productive. There are many possible obstacles confronting traditional learning groups (Johnson, Johnson & Holubek, 1989).

-Group members often rely on one person to do all of the work.

-Students who find themselves doing most of the work often decrease their effort to avoid appearing foolish.

-High ability group members may take over the project to benefit themselves alone.

-High ability students may give all the explanation resulting in more learning for themselves while the lower ability students are reduced to being a captive audience.

-Conflict and power struggles often get in the way of group work.

-Dysfuntional divisions of labor may be formulated.

-Pressures to conform may suppress individual effort.

Cooperative learning is the instructional use of small groups so that students work together to maximize their own and others' learning. The interdependence found among members of a cooperative group is the result of students' perceptions that the only way for the group to succeed as a whole is for each member to succeed individually. the problems facing traditional learning groups can be eliminated when groups are properly constructed using the cooperative learning model (Johnson & Johnson, 1987).

In a recent study, researchers looked at strategies to facilitate the discussion between students and peers and between students and teachers. This type of discussion has been found to lead to conceptual change. The research indicated that cooperative learning may provide the necessary strategies which have been lacking in the conceptual change model. (Lonning, 1993).

Cooperative learning contains components not found in traditional learning groups. These components are the keys to cooperative learning groups' high achievement of learning goals. These components are described below (Johnson & Johnson, 1986, 1987, 1989; F. Johnson, 1987).

1. Positive Interdependence: Students perceive that their group realizes the need to work together to achieve a common goal.

2. Face-to-Face Promotive Interaction: When students work face-to-face in small (2-6 member) groups, they have the opportunity to: (a) provide one

another with help and assistance, (b) exchange needed resources, (c) provide one another with feedback on performance and responsibilities, (d) challenge one another's conclusions and reasoning and thus promote higher thinking on both sides, (e) exert effort to achieve common goals, (f) influence one another's efforts to achieve mutual goals, (g) act in trusting and trustworthy ways, (h) become motivated to strive for mutual benefit, and (i) feel less anxiety and stress.

3. Individual Accountability/Personal Responsibility: Focus on the work of the individual. This assures that each member's contributions to the group are identified. This accountability within the group results in strengthening the individual.

4. Interpersonal and Small Group Skills: Working successfully within a group requires interpersonal and group skills which must be taught.

5. Group Processing: This occurs when group members reflect on the work they have done, whether they need to work differently to achieve their goal or decide what needs to be done to maintain their present level of functioning.

To the science educator, cooperative learning's outcomes, of promoting greater use of higher reasoning strategies and critical thinking skills, make it an essential tool to allow students to transcend the level of simply memorizing scientific facts and theories to the level of acting out the role of the scientist themselves. Critical thinking skills enable the science student to examine, evaluate, and apply information in a way accomplished by no other learning strategy (Johnson & Johnson, 1989).

Group Problem Solving in the Global Thinking Project

Due to the constructivist nature of teaching and learning within the Global Thinking Project, the cooperative learning model is used to facilitate group problem solving. The components involved in the cooperative model allow students to utilize the constructivist view that knowledge is not the same from one student to the next, that the student is in control of the what, how and when of his/her learning and that diversity in gender, ethnicity, religion and

points of view are valuable and afford opportunities for addressing difficult questions, exploring different world views, comparing rival hypotheses, and examining controversial open-ended problems (Springer, 1993).

The Global Thinking Project contains an element that utilizes cooperative learning in a unique way. This element is the generative model of anticipation/participation. In the generative model, students react to stimuli by processing information and actively constructing meaning from it. Learning results from the abstract and distinctive, yet concrete association that students generate using prior experiences stored in the long-term memory along with the current interaction with the environment (Osborne & Wittrock, 1983; Wittrock, 1974). This cognitive model empowers the student, through his/her interaction with teachers and peers, to anticipate future events, understand the consequences of current and future actions and to participate in local, global, and also personal change. Working within the generative model, students realize that they are responsible for creating their own environment rather that being responsible only for the behavior standards required by their present environment. as the students work in cooperative groups on Global Thinking Project problems, they learn to share not only academic information, but also what it means to be human beings among other human beings who share the same world and future (Hassard, 1989).

Summary

The components of cooperative grouping allow groups to work together in a synergistic fashion which facilitates cognitive development in group members. Problem-solving within the cooperative group model results not only in higher order thinking, but also in the development of interpersonal skills necessary for communication with and understanding between students, their teachers and peers. The generative model of anticipation/participation, found in the Global Thinking Project, uses cooperative grouping in a unique way that may empower students to anticipate change globally and to act on it locally.

Research Methodology

In an effort to address the research question, three methods of data collection will be used. These methods are pre and post administration of a problem solving task, the administration of teacher and student evaluative surveys, and observer reflection on student verbal and non-

verbal behavior during the problem solving tasks. These behaviors will be observed both immediately and on video-tape of the pre and post problem solving tasks by a member of the research team.

Students will be randomly assigned to groups of four. Roles of checker, tracker, materials manager and communicator will be assigned by the directing teacher. These roles are part of the Global Thinking Project's general directions.

These groups will take a period of forty-five minutes to read the Wet Solutions paper, brainstorm problem statements, select a favorite problem statement, brainstorm alternate solutions, rate the solutions from one to ten, and write a paragraph describing the water system that they have created. This process will be video-taped and observed by a member of the research team.

Results will be derived from field observations, video-tape recording and coding , and teacher and student surveys. The coding systems will emerge from the study, however, the Global Thinking Project's outcomes will be used as a base. These objectives are systemic reasoning, anticipation of the future, attitude, knowledge construction, thinking globally, telecommunications, creativity, responsibility, process and teachers as facilitators.

Upon completion of the pre problem solving task, students will take part in the Global Thinking Project. Groups will remain as assigned for the pre problem solving task, and roles of the members will remain the same.

Student participants will be given the original Wet Solution problem solving task and the problem solving process will be repeated. The students will spend about one month exploring the problems. This lengthy period between pre and post problem solving tasks will reduce the effect of the pre problem solving task on the post problem solving task. The problem solving process will be video-taped and the results reviewed and coded.

Student and teacher evaluative surveys will then be completed. Student and teacher responses will be compared and interpreted. Comparisons will be made within and across student groups. Researcher conclusions will be drawn from these comparisons. Student and teacher surveys are individually unique and student and teacher surveys will be completed on an individual basis.

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An Investigation of Cooperative Learning and Group Problem Solving Within the Global Thinking Project

Research Instruments

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Wet Solutions

How to Maintain our Future Water Supply

In the first century A.D. the Romans obtained 300 million gallons of water per day by 14 aqueducts which collectively totaled over 1300 miles. The remnants of these engineering marvels are still standing in Italy today. Large usage of water for everything from the plush public baths to flushing the plentiful wastes through the Cloaca Maxima was a hallmark of the Roman civilization.

The "new Roman" or industrialized nations of the world use water at incredible rates, 16,000 gallons daily per person in the United States, and demand that adequate supplies for every purpose be instantly available no matter where they live. Present-day systems dwarf Roman efforts by several orders of magnitude. When the total water demand per person is considered, it becomes evident that water problems are the most serious of those facing man, since we cannot live without water for more than three days! Already droughts in many parts of the world are severely restricting human activities. With the beginning of a new century, people are taking a new look at our water supplies.

Your Assignment is to explore the conditions which threaten our quantity and quality of water. As you look forward to the future, consider the actions that have been taken in the past to ensure our needs and the success/failure rate of those actions. The future will have about one billion new humans every five years to supply if current trends remain constant.

Part 1. Brainstorming Possible Problems

Do not begin this section until after you have read the above situation and thought about it or discussed it. When you feel you understand the situation, brainstorm as many problems concerning water in the future as you can. List only your 10 best ideas, and number each one.

Part 2. Identifying the Underlying Problem

Select one of the problems you have just listed and write it below. It should begin with the words "In what ways might..." or "How might...". Your problem should be written as clearly and specifically as possible. Write your problem below.

Part 3. Alternative Solutions

Brainstorm as many possible solutions as you can to the problem as you have defined them above. Record only 10 of your solutions below; please number your solutions.

Part 4. Scenario if Solutions are Enacted

Write a brief description (a few paragraphs) about the water system as if your plans were fully implemented.

COOPERATIVE LEARNING EVALUATION
STUDENT QUESTIONS

Directions: Please mark with an "X" in the box to the left of each answer that is most like how you feel for each question. This is not a test; there are no correct answers.

1. How interesting did you find your work with the group?
[ ] a. Very interesting
[ ] b. Fairy interesting
[ ] c. Somewhat interesting
[ ] d. Not very interesting
[ ] e. I was not interested at all

2. How difficult did you find your work in the group?
[ ] a. Extremely difficult
[ ] b. Somewhat difficult
[ ] c. Sometimes difficult
[ ] d. Not too difficult - just about right
[ ] e. Very easy

3. How many times did you have the chance to talk during the group session(s) today?
[ ] a. None
[ ] b. One or two times
[ ] c. Three or four times
[ ] d. Five or more times

4. If you talked less than you wanted to, what were the main reasons?
[ ] a. I felt afraid to give my opinion
[ ] b. Somebody else interrupted me
[ ] c. I was not given the chance to give my opinion
[ ] d. Nobody paid attention to what I said
[ ] e. I was not interested in the problem/activity
[ ] f. Other. Explain. _____
_____

5. Did you get along with everyone on your team?
[ ] a. With a few of them
[ ] b. With half of them
[ ] c. With most of them
[ ] c. With all of them
[ ] d. With none of them

Directions: Please answer the following questions in the space provided.

6. Could certain questions have been worded differently to help you understand them better? Explain._____
_____
_____
_____

7. Did you like the your role in the group? Why, or why not?
_____
_____
_____

8. Did you feel that your ability to solve problems changed? How? _____
_____
_____
_____
_____

COOPERATIVE LEARNING EVALUATION
TEACHER QUESTIONS

Directions: Please answer the following questions in the space provided.

1. What were the most effective (least effective) parts of the project? Why?

2. Did the students work well in groups? What was successful? What was unsuccessful?

3. Was there any change in the students ability to work in groups from the beginning of the project to the end of the project?

4. What did you do as facilitator that led to the success of the groups? What , if anything, did you do that did not lead to the success of the groups?

5. What about the project facilitated group problem solving? Was there anything about the project that did not lead to successful group problem solving? Explain.

6. What skills that were used during the project do you think will be used in future problem solving tasks?

7. Overall, do you think the project was successful? Explain.

Environmental Concerns of Teachers Attending a Global Thinking Teacher Preparation Institute

by Margaret H. Venable
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and

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Agnes Scott College

Abstract

Nineteen teachers who attended the Global Thinking Teachers Preparation Institute responded to questions about their concerns about the environment, their sources of knowledge about these concerns and their views about who was responsible for solving them, and the extent to which they viewed these concerns as local, national or global in scope. The five most frequently cited concerns were air/water/land pollution, waste disposal/recycling, deforestation, ozone hole and loss of habitats. The teachers most frequently cited individuals as responsible for solving environmental problems, and most frequently viewed the problems as global in scope. Teachers overwhelmingly cited the media as their primary source of information about environmental problems. The data were compared with those from a similar study of Georgia Middle School students.

Introduction

The Global Thinking Project at Georgia State University is an effort to engage teachers and students in collaborative investigations of their local environments, and in global discussions of environmental issues. We have written and field tested the *Global Thinking Teacher's Resource Guide*, an interdisciplinary, environmental-science-based curriculum designed to help teachers engage students in a series of "projects" in which environmental issues (such as ozone, water quality, and solid waste) are investigated locally. Students collaborate globally using a computer-mediated telecommunications network (EcoNet).

One of the goals of the Global Thinking Project is to establish a network of teachers in Georgia who are able to use their knowledge of environmental science, telecommunications, and cooperative learning to collaborate with teachers and their students

in other countries. The Global Thinking Teacher Preparation Institute was designed to provide hands-on experiences and content background which would help teachers implement the Global Thinking curriculum more effectively.

The first annual Global Thinking Teacher Preparation Institute was held during July, 1993, at Simpsonwood Conference Center in Norcross, Georgia. Twenty teachers from school districts that agreed to implement the Global Thinking curriculum, including one teacher from Australia and one from Spain, participated in an intensive, five and a half day residential institute designed to familiarize participants with the philosophy, objectives and content of the global Thinking Project. Through participation in collaborative on-site studies of air and water quality, including hands-on practice using the ALICE software, teachers explored the content of the Global Thinking Project, the use of technology to establish an online community of science learners, the use of cooperative learning in the project's learning activities, and the role of the teacher in the Global Thinking classroom.

As part of the Global Thinking Teacher Preparation Institute, we were interested in exploring the teachers' initial knowledge and attitudes about environmental problems. The purpose of the study was to identify their sources of knowledge about these concerns and their views about who was responsible for solving them, and to determine the extent to which these concerns were viewed as local, national or global in scope. In addition, we wondered how teachers' answers would compare with students' answers to the same questions.

Methods

Questionnaires (see appendix 1) were distributed to participants during registration. The majority were collected at the beginning of the first session. We explained to the teachers that the purpose of the questionnaires was to obtain information about the people involved in the Institute in order to help study and evaluate the program. Names were not included on the questionnaires and codes were used instead to ensure anonymity. The teachers signed consent forms agreeing to participate in the study under the condition that information about them would not be identified with them individually.

Results

Demographics

Twenty teachers participated in the Summer Institute; nineteen agreed to participate in the study and completed questionnaires. Of these nineteen teachers, three were males and sixteen were females. They ranged in age from 28 to 51 with a mean age of 40. The majority of the teachers (17) were U.S. citizens, but one teacher was a citizen of Spain and another was a citizen of Australia. Fifty three percent of the teachers primarily taught science, sixteen percent taught primarily social studies and five percent taught math. The remaining 26 percent either taught in another area or taught in more than one area. Sixty three percent of the teachers taught in either a middle school or a junior high school, 21 percent taught at the elementary level and 16 percent taught in a high school. The majority of the teachers had eleven or more years of experience: one had taught for 1 to 3 years, six had taught for 4 to 10 years, eight had taught for 11 to 20 years and three had taught for more than 20 years. One person did not respond to this question.

Concerns of Teachers

The teachers were asked to list four environmental concerns. Of the concerns listed, air, water or land pollution was listed most frequently (25 times of 33 percent of the total concerns). Waste disposal or recycling comprised sixteen percent of the concerns (12 times), deforestation represented 12 percent (9 times) and the ozone hole and loss of habitats each represented 8 percent (6 times each). Each of the remaining concerns comprised four percent or less of the sample: conservation/depletion of resources, overpopulation, pesticides, global warming, radiation, extinction of species, acid rain, noise pollution, "other", or "no response." (see appendix II)

In a similar study of middle school students' environmental concerns, McIlveene found that the most frequently cited concern of Georgia middle school students was also air or water pollution. Ozone depletion and deforestation were also mentioned frequently by both groups. A comparison of the top five concerns of U.S. teachers and students is shown in figure 1.

Figure 1. Top Five Concerns of Teachers and Students

Teachers	U.S. Students
1) air/water/land pollution	1) air or water pollution
2) waste disposal/recycling	2) deforestation
3) deforestation	3) ozone depletion
4a) ozone hole	4) rubbish/littering
4b) loss of habitats	5) displacement of species

Source of Information About, Responsibility for and Scope of Global Problems

The most frequently cited source of information for the teachers surveyed was media (86%). Other less frequently cited sources of information included personal observation, professionals and courses (see figure 2).

Figure 2. Teachers' Sources of Information About Environmental Problems

Media	86%
Personal Observation	6%
Professionals	3%
Courses	3%
Other	3%

The teachers surveyed most often cited individuals (66%) as responsible for finding solutions to the problems they identified. Government was identified as responsible in 27% of the responses, while 6% cited business and industry (see figure 3).

Figure 3. Teachers' Views of Responsibility for Solving Problems

Individuals	66%
Government	27%
Industry	6%
Other	1%

Most of the environmental problems were viewed as global in scope by this group of teachers (73%). (See figure 4)

Figure 4. Teachers' Views of Scope of Environmental Problems

Local	12%
National	14%
Global	73%

Comparison of Teachers with Students

In data collection by McIlveene, the most frequently cited sources of information about environmental problems for U.S. middle school student were media (51%) and school (22%). Since the teachers' most frequently cited source of information was also media (86%), it appears that most of the participants in the Global Thinking Project rely either directly or indirectly on media as their primary source of information about environmental problems (See figure 5). Although there appeared to be no remarkable differences between

Figure 5. Comparison of Teachers' and Students' Sources of Information About Environmental Problems

	Teachers	Students
Media	86%	51%
Personal Observation	6%	18%
Professionals	3%	0%
Courses (School)	3%	22%
Other	3%	8%

teachers and students in their views about who is responsible for solving the environmental problems identified (See figure 6), students appeared more likely than teachers to view the problems as national or global in scope (See Figure 7).

Figure 6. Comparison of Teachers' and Students' Views of Responsibility for Solving Problems.

	Teachers	Students
Individuals	66%	60%
Government	27%	15%
Industry	6%	10%
Environmentalists	0%	2%
Other	1%	13%

Figure 7. Comparison of Teachers' and Students' Views of Scope of Environmental Problems.

	Teachers	Students
Local	12%	7%
National	14%	26%
Global	73%	67%

Conclusions

The most frequently cited environmental concerns of the teachers in this sample were air/water/land pollution, waste disposal/recycling, deforestation, ozone hole and loss of habitats. The most frequently cited source of information for teachers was the media and teachers viewed individuals as primarily responsible for solving environmental problems. Most environmental problems were viewed by the teachers as global in scope.

The responses obtained from this group of teachers were remarkable similar to those obtained by McIlveene in a similar study of Georgia middle school students. Three of the top five concerns were the same for both groups. Most striking was the reliance of both groups either directly or indirectly on the media for information about environmental problems. Because the data regarding the teachers presented in this study are based on a very small sample, the result must be interpreted cautiously. However, they suggest that future studies examine the factors which influence teachers' and students' knowledge about

Appendix I.
Global Thinking Project Questionnaire
Summer, 1993

Background Information:

1. Your gender: _____Female _____Male
2. Your age: _____
3. Nationality: _____
4. What subject(s) do you primarily teach?_____
5. Describe your certification type(s) and level(s):

6. I am a classroom teacher in:(elementary school/middle school/etc.)

7. How many years of teaching experience do you have at this level?
   1-3_____ 4-10_____ 11-20_____ More than 20_____

8. How many total year of teaching experience do you have?
   1-3_____ 4-10_____ 11-20_____ More than 20_____

9. Do you teach in a self-contained classroom or as a team teacher?
   self-contained_____ team_____

10. Do you have any other non-teaching job experience? If so, please describe.

11. Check which of the following experiences in in-service training you have had. Also describe, on the back of this paper, the nature of each of your experiences (i.e., a 1-day course, etc.) and whether you have had any experience implementing these strategies in class with students:
    cooperative learning _____
    use of computers in the classroom_____
    environmental education_____
    other_____

12. Describe any experiences you have had in a science research setting. (industrial lab, Earthwatch, etc.)

13. List any environmental projects in which you have been involved. (e.g., recycling, etc.)

14. List any professional societies related to the environment in which you are a member. (e.g., World Wildlife Foundation, Greenpeace, etc.)

15. Based on your opinion, what are four concerns about the environment that are most important to you? Why are they of concern to you? Try to be as specific as you can.
Concern 1.

Concern 2.

Concern 3.

Concern 4.

16. What has been your primary source of information about each of these four concerns?
Concern 1._____
Concern 2._____
Concern 3._____
Concern 4._____

17. Who do you think is responsible for solving each of these concerns?

Concern 1._____

Concern 2._____

Concern 3._____

Concern 4._____

18. Classify each concern as a local concern, national concern, or global concern.

	Local Concern	National Concern	Global Concern
Concern 1.	_____	_____	_____
Concern 2.	_____	_____	_____
Concern 3.	_____	_____	_____
Concern 4.	_____	_____	_____

Appendix II.

Teacher Concerns in Rank Order

	Percent	# of times chosen
air/water/land pollution	33	25
waste disposal/recycling	16	12
deforestation	12	9
ozone hole	8	6
loss of habitats	8	6
conservation/depletion of resources	4	3
overpopulation	4	3
pesticides	3	2
global warming	3	2
radiation	1	1
extinction of species	1	1
acid rain	1	1
noise pollution	1	1
other	1	1
no response	1	1

Environmental Concerns of Middle Grade Students in the Global Thinking Project

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Abstract

This study examines the environmental concerns of middle grade students in Australia, Russia, Spain and the United States. Similarities and differences are described regarding student environmental concerns, how they learned about the concerns, who they think are responsible for the concerns, the difficulty of solving, and the extent of the concern (local, national, global). The information for this study is based on questionnaires that were administered to middle grade students who were participants in The Global Thinking Project during the 1992-93 school year.

Introduction

Our time is known as the technical age. With it has come economic growth and lifestyle comforts that has often meant a high price in environmental consequences. We are being presented with daily reminders of the results of abuse and neglect of our Earth systems such as global warming, contamination of water sources, ozone depletion and the problems of hazardous waste disposal. Educating society about the interrelationships between people and their environment has become a major concern.

Prior to the late 1960's, the term "environmental education" essentially meant conservation education which is aimed at natural resource management (Leftridge & James, 1980). This level of concern served society's needs until the public became aware of the fact that society and the quality of life suffered because of a deteriorating environment. The focus of environmental education began to concentrate on coordinating the child's view of life with an ecological view of the world. The goal of environmental education became environmental accountability. Stapp (1974) describes the purpose of environmental education as developing a citizenry which is knowledgeable about the environment. and its problems, and is aware of how to become effectively involved in working toward the development of a more livable future, and is motivated to do so. The development of positive attitudes and acquisition of

knowledge toward and about the environment became the objective of environmental educators.

Although we have an environmentally aware population, people still lack the necessary knowledge about the roots of the problems and specifically what actions they can and should take (Noe & Snow, 1992). The purpose of environmental education is not just to enlighten students on problems in our world but to make such an impression on them that they will take responsibility toward solutions. Environmental education needs to connect the individual to today's environmental problems. At the same time, education should help individuals learn what they can and should do to improve the environment and create a desire in each person to take action, including actions that require individual sacrifice.

For this to happen, people must first believe that solutions to environmental problems are necessary, and must understand the consequences to the environment and themselves of not taking action to correct these problems. To get this message across, educators must make students aware, provide them with the skills, and encourage them to participate in the resolution of environmental problems. Such a program requires student involvement in investigating real environmental issues in their local communities as well as their reflections on universal concerns. If the student has a concern or emotional feeling about a problem and he or she feels that they can do something about resolving the problem, then the dissemination of information might foster a sense of concern that could lead to action. The Global Thinking Project is an environmental education program that reflects this philosophy.

The focus of the Global Thinking Project (Hassard & Weisberg, 1992) is on environmental issues and problems from a global perspective. Students learn that local problems and issues are similar to those of people around the world, and that the actions of people everywhere have global consequences. The project is based on cross-cultural, interdisciplinary teaching materials that promote global thinking. Through the project, students are encouraged to identify important global problems with the help of students from other countries. collaboration between the schools is accomplished by using the computer network established by the Institute for Global Communications. Schools in the United States are connected via EcoNet, schools in Russia via GlasNet, schools in Europe via GreenNet, and schools in Australia and New Zealand are connected via Pegasus.

The objective of this study is to examine middle grade students knowledge of environmental concerns. The subjects in this study were participants in the Global Thinking Project during

the 1992-93 school year. It is the purpose of this study to determine what student concerns are and how the concerns compare to the concerns of students in other countries. This study focuses on the following four questions:

1.What environmental concerns did students identify as important?
2. What were the sources of student knowledge about the environment?
3. Who do students think is responsible for solving environmental concerns?
4. How do students classify environmental concerns (e.g.,local, national, global)?
5. How do students rate the difficulty of solving environmental concerns (e.g.,easily solved, more difficult, very hard to solve)?

Method

Subjects

All of the subjects in this study were participants in the Global Thinking Project during the 1992-93 school year. The subjects included 216 middle grade students aged 12 to 15 years old. The majority of subjects were 13 year old females. The students chosen to be participants in the Global Thinking Project were determined by the teacher and circumstances. Some schools randomly chose one class to participate while others selected the students that would compose the Global Thinking class. In one school the Global Thinking Project was held as an after school club and was composed of students in both seventh and eighth grade.

Procedure

The study took place during winter and spring of 1993. Students from each school completed the questionnaires (Appendix A) regarding their environmental concerns. The teacher read the directions and the students completed the following information: four main environmental concerns and reasons why, who they believe is responsible for solving the concern, where they first learned about the concern, the difficulty of solving the concern, and the degree of the concern (local, nation, or global). Student were also asked to draw a picture of the method for solving one of their concerns. Following the survey, several students from each class were interviewed and asked about their responses. Students in the United States and Russia answered the questionnaires in January 1993. The questionnaires were administered in Russia by American teachers that traveled to Russia to visit the Global Thinking Classes. The questionnaires were administered to the American students during the teachers absence. Teachers in Australia and Spain collaborated with Dr. Hassard to administer the questionnaires

to students that were in their Global Thinking Classes.

Results

The data collected from the questionnaires was analyzed using the Statistical Program for Social Sciences (SASS). This study examined each area by total responses to all four concerns. Although there were 216 subjects, some did not list a total of four concerns.

Question 1. What environmental concerns did students identify as important?

In order to get this data we asked each student to list four environmental concerns. The total responses represented on this graph include all four responses from each student in the four countries. The total responses to question one indicated that Air Pollution is the most common concern with almost 20%, followed by Water Pollution at approximately 16%. Ozone and Deforestation each represented approximately 15% of the concerns.

Figure 1. Environmental Concerns Identified by Students in Australia, Russia, Spain and the United States

Concern	Percent
Air Pollution	19.9
Water Pollution	16.1
Ozone Depletion	15.7
Deforestation	15.2
Disappearing Species	10.5
Rubbish/Litter	10.1
Lack of Recycling	3.9
Other	3.0
Radiation Pollution	2.2
Toxic Wastes	1.7
Global Warming	1.2
Overpopulation	.6

Although there were differences in percentages of responses from each country, the students appeared to agree on the choice of the most important environmental concerns. Water Pollution, Air Pollution, and Deforestation were selected as three of the top four environmental concerns in all four countries. Disappearing Species was specified as one of the four environmental concerns in Russia and Spain. Ozone Depletion was chosen in Australia and the United States as an important environmental concern.

Figure 2. Percentage of Students Identifying Environmental Concerns

Country	Concern	Percent
Australia	Water Pollution	21.2
	Air Pollution	19.6
	Ozone Depletion	19.6
	Deforestation	15.1
Russia	Air Pollution	21.1
	Water Pollution	18.5
	Disappearing Species	16.5
	Deforestation	13.2
Spain	Water Pollution	20.8
	Deforestation	20.8
	Air Pollution	14.5
	Disappearing Species	10.4
United States	Air Pollution	20.0
	Deforestation	15.2
	Water Pollution	12.9
	Ozone Depletion	12.9

Question 2. What are the sources of student knowledge about the environment?

Figure 3 represents the student responses for sources of learning about the concern. The responses represented on this chart are a total of responses to all concerns. Media accounted

for approximately 43% of all the responses. Print, School and Personal Observation accounted for 18.5%, 17.3% and 15.1% respectively. The responses to Parents and Others were 3%.

Figure 3. Source of Environmental Concerns Identified by Student in Australia, Russia, Spain and the United States

Source	Percent
Media	42.9
Print	18.5
School	17.3
Personal Observation	15.1
Parents	3.1
Other	3.1

Figure 4 represents the learning sources by country. The results are shown in percentages of responses for each country. The Media was the most common answer for learning source and was responsible for over 40% of the responses in each country. School, Personal Observation, and Print were next most chosen responses, although by much lower percentages than Media.

Figure 4. Percentage of Students Identifying Learning Sources

Source	Country	Percent
School	Australia	19
	Spain	19
	United States	22
Personal Observation	Australia	21
	Russia	8
	United States	18
Print	Russia	37
	Spain	21

Question 3. Who do students think is responsible for solving environmental problems?

Figure 5 illustrates the students responses indicating who they believed was responsible for solving the environmental concerns. The responses on this graph represent the total responses for all concerns. The most chosen response was People with almost 53% of the total responses. Both Government and Other represented approximately 175 of the responses, Industry 9%, and Environmentalist 5%.

Figure 5. The Responsibility for solving Environmental Concerns as Identified by Students in Australia, Russia, Spain, and the United States

Responsible	Percent
People	52.6
Government	16.9
Other	16.6
Industry	9.3
Environmentalist	4.6

Figure 6 represents the percentage of student responses in each country when questioned about who they believe is responsible for solving the environmental concerns. People is the most common response, with more then 50% of the responses in three of the four countries. Government and Other are the next most common response by students.

Figure 6. Percentage of Students Identifying Who is Responsible for Solving Environmental Concerns

Country	Responsible	Percent
United States	People	60
Australia	People	50+
Russia	People	30+
Spain	People	50+

Question 4. How do students classify environmental concerns (e.g., local, national, global)?

The students were asked to indicate the depth of the concern: Local, National, or Global. The responses in the figure represent the total responses for all four countries. The most chosen depth of concern response was Global with 69.7%, followed by National with 23.4%, and Local with 6.9%.

Figure 7. A Classification of Environmental Concerns Identified by Students in Australia, Russia, Spain, and the United States.

Depth	Percent
Global	69.7
National	23.4
Local	6.9

Figure 8 represents student responses when asked to classify the extent of the environmental concern (e.g., Local, National, Global). The results are described by percentage of responses in each country. The majority of responses in all four countries is Global. The high percentage of responses in each country indicated that students involved in the questionnaire view environmental concerns as global in nature.

Figure 8. Percentage of Students Classification of Environmental Concerns

Country	Depth	Percent
United States	Global	67
	National	25+
	Local	5+
Australia	Global	80
	National	15+
	Local	5+

Country	Depth	Percent
Russia	Global	61
	National	25+
	Local	5+
Spain	Global	97
	Local	3+

Question 5. How do students rate the difficulty of solving environmental concerns (e.g., Easily Solved, More Difficult, Very Hard)?

The students were asked to describe the difficulty of solving the environmental concerns. The responses in figure 9 represent the total responses for all four countries. More difficult to Solve received 40.8% of the responses, followed by Very Hard 39.6% and Easily Solved 19.5%.

Figure 9. Students Rating of Environmental Concerns by Difficulty to Solve

Difficulty to Solve	Percent
More Difficult	40.8
Very Hard	39.6
Easily Solved	19.5

Figure 10 represents student responses by country. The responses are compared by percentage of responses in each country. The responses of More Difficulty and Very Hard represented 70% to 95% of all the responses in each country. Russia and the United States responses indicated that the environmental concerns would be more difficult to solve, while Australia and Spain respondents view the concerns as being very hard to solve.

Figure 10. Percentage of Students Rating by Difficulty to Solve

Country	Difficulty to Solve	Percent
United States	More Difficult	40+
	Very Hard	40+
	Easily Solved	15+
Australia	Very Hard	30+
	More Difficult	30+
	Easily Solved	30+
Russia	More Difficult	40+
	Very Hard	30+
	Easily Solved	10+
Spain	Very Hard	50
	More Difficult	40+
	Easily Solved	5+

Discussion

Based on the data from this study, there does not appear to be major differences of environmental concerns between the students from Australia, Russia, Spain, and the United States. Responses from all countries identified Air and Water as the most common environmental concerns, the Media as the most common source of information, People as responsible for the environmental concerns, the concerns as Global in extent, and the concerns will be More Difficult or Very Hard to Solve.

When examined as a whole, the environmental concerns of students in the United States, Australia, Russia, and Spain indicate that Air Pollution is the most common concern. But an individual analysis of concerns by country indicates that Air Pollution is the most common response in the United States and Russia. In Australia the most common concern response was Water Pollution while Ozone Depletion was the most common response by the students in Spain. Air and Water Pollution represented from 33% to 40% of all the concerns in each of the four countries. The United States and Australia indicated Rubbish/Litter, with

approximately 12% of the responses, is a concern to the students in those countries. Deforestation was responsible for 13% to 20% of the responses in each country.

The students appear to have similar learning sources, with Media the most cited response. The second choice for learning sources appears to be Print when all responses are examined as a total, but differed when compared by country. Spain and Russia cited Print as the second most common learning source. The United States chose School, while Australia responses cited Personal Observation as the second choice of learning source.

Over 50% of the total responses cited People as responsible for the environmental concerns. When examined by country, People received more than 50% of the responses except in Russia, where People received 32% followed by the Government with 27% of the responses.

The depth of concerns from all countries were similar, with Global being the most frequent response, followed by National, and then Local. There was a difference in the percentage of responses in each country. The students from Spain indicated that Global was the major depth of concern with 97%, Australia 80%, the United States 67%, and Russia with 61%.

The difficulty of solving the environmental concerns indicated that More Difficult was the most chosen degree of difficulty. When examining the responses from each country, More Difficult was chosen by respondents in Russia and the United States as the most common degree of difficulty to solve. In Australia and Spain the responses indicated that the concerns would be Very Hard to Solve. In each country the responses for More Difficult and Very Hard varied by less than 5%.

This study identifies the similarities of student environmental concerns from four different countries. It appears that these middle grade students have similar ideas about the environment regardless of the continent on which they reside.

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Teacher Opinions About the Global Thinking Project

by Wayne Robinson
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Who are the Global Thinking Teachers?

Who are the teachers involved in the Global Thinking Project? How long have they been classroom teachers? What are their previous experiences with distance learning and telecommunications projects? How much time do they actually spend with the Global Thinking Project curriculum? These, as well as other similar questions, were the focus of the Global Thinking Project Questionnaire sent to teachers in May, 1993.

Of the approximately forty teachers who were mailed a survey, twenty-four responded. Teachers were asked to respond to forty-seven questions dealing with their backgrounds and their past nine month experience with the Global Thinking Project. Their answers and comments are summarized in the pages which follow.

The average GTP teacher is 40-46 years of age. The majority (75%) of teachers were female. Twenty-one of the twenty-four persons responding were from the United States, with the remaining three being from outside the U.S. boundaries. Twenty-three of the twenty-four educators listed English as their native or first language. The other native language listed was Spanish.

Who, What and Where Do Global Thinking Project Teachers Teach?

Of the persons responding to the 1993 Teacher Questionnaire, almost one-half (45.8%) taught science as their major subject area. 12.5% of Global Thinking Project teachers taught mathematics as their major subject and 8.3% of participants listed social studies as their main teaching subject. One-fourth (25.0%) of persons responding to the survey were responsible for teaching language arts, computer science or an unspecified subject. An additional 8.3% listed more than one discipline as their major content area (see figure 1).

Figure 1. Major Subject Area

Subject Area	Percent
Science	45.8
Other	25.0
Mathematics	12.5
Social Studies	8.3
>One response	8.3

Global thinking project teachers had a wide variety of students involved in the project. Students participating in the project ranged from eleven (11) in one classroom to one hundred and fifty (150) in another. The mean number of students participating in each school was 82.182 students. The number of African-American students in 1993 Global Thinking Project classrooms also varied greatly. Almost thirty percent (29.2%) of GTP classes had one or less African American students, but another 20.9% had thirteen African American students or more. The remaining classes had between two to nine African American students.

Global Thinking Project schools were located primarily in suburban areas (53.3%). Approximately one-fifth (20.8%) of GTP schools were located in urban settings and 16.7% of schools were found in sparsely populated locations. There was one person who did not respond to this question (see figure 2).

Figure 2. School Setting

School Setting	Percent
Suburban	58.3
Urban	20.8
Sparsely populated	16.7
No response	4.2

Computer Experiences of Global Thinking Project Teachers

Over fifty-four percent (54.2%) of teachers described themselves as teachers who had occasionally used a computer system prior to their involvement with the Global Thinking Project in 1993. Over one-third (37.5%) said they frequently used a computer system. Only

8.3% described themselves as computer novices. Almost nine of every ten teachers surveyed (87.5%) said that they had used a telecommunications package before their involvement with the project.

All teachers responding to the questionnaire indicated that they spent one hour or less on-line during each week of the telecommunications project. 20.8% of teachers spent less than fifteen minutes on-line, 37.5% spent fifteen to thirty minutes on-line, and 29.2% spent between on-half hour on-line each week. Three teachers (12.5%) did not respond to this question (see figure 3).

Figure 3. Average Weekly Time On-Line (Actual)

Time On-Line	Percent
<15 minutes	20.8
15-30 minutes	37.5
30-60 minutes	29.2
No Response	12.5

The majority of 1993 Global Thinking Project teachers did not have computer systems at home. 58.3% of teachers did not have a home computer, 37.5% of teachers did and one respondent (4.2%) chose not to answer the question.

Access to telephone lines differ greatly in Global Thinking Project schools. Seven (7) teachers responding to the survey had designated phone lines in their classrooms, six (6) teachers shared a telephone line in their classroom with at least one other teacher in the building and nine (9) teachers used telephone lines outside of their environmental educational classrooms. There was also one (1) multiple response and one (1) no response to this question (see figure 4).

Figure 4. Phone Line Location At Schools

Location	Responses
Dedicated	7
Shared	6
Outside	9
Multiple response	1
No response	1

Teachers spent varied amounts of time with the Global Thinking Project curriculum. According to results from the May, 1993 questionnaire, one-half (50.0%) of the classroom teachers responding spent between thirty minutes and two hours each week participating in the Global Thinking Project. Specifically, 16.7% spent less than fifteen minutes each week, 12.5% spent fifteen to thirty minutes each week, 29.2% spent thirty to sixty minutes each week, 20.8% spent one to two hours each week and 8.3% spent over two hours each week working with GTP curriculum materials. 12.5% of those surveyed chose not to respond to this question (see figure 5).

Figure 5. Actual Time Spent in Project (Weekly)

Time	Percent
< 15 minutes	16.7
15-30 minutes	12.5
30-60 minutes	29.2
1-2 hours	20.8
> 2 hours	8.3
No response	12.5

As a part of the survey instrument, teachers were asked whether they felt that the content of the project was interesting to students in the Global Thinking Project. Overwhelmingly, respondents stated that the project content was indeed interesting to the student population. In fact, only 8.3% of teachers responding felt that project content was not interesting to students. Most teachers (75.0%) also felt that project activities were fun to carry out.

Almost two-thirds of Global thinking Project teachers (62.5%) felt that project activities were appropriate for student in their classes. Approximately one-fifth (20.9%) felt that project activities were inappropriate for their students. Remaining teachers had either no opinion (12.5%), or failed to respond (4.2%) to the question. Similarly, about two-thirds (70.8%) of teachers felt that curriculum material were appropriate for students in their classes and approximately one-fifth (20.8%) of teachers felt that the curriculum was inappropriate for their students.

Question thirty-seven of the questionnaire dealt with the effect of Global Thinking Project exposure on cooperative learning strategies in the classroom. The results of this question were mixed, with 54.2% of teachers stating that they were using a greater degree of cooperative

learning in their classrooms because of exposure, and 29.2% of teachers stating that they did not. 16.6% of teachers either had no opinion or did not respond to the question. Of the twenty-four persons responding to the survey instrument, fifteen felt that the Global Thinking Project made their curriculum more interesting. Three teachers felt that interest in their standard curriculum was unchanged, and two teachers did not respond to this question (see figure 6).

Figure 6. GTP Makes Curriculum More Interesting

Interest Level Increased	Response
Agree	15
Strongly Agree	4
No Opinion	3
No Response	2

After participating in the Global Thinking Project for a year, two-thirds of the teachers surveyed said that both they and their students felt like they belonged to a global community. By contrast, only 4.2% felt isolated from the world. Remaining responses were "no opinion" (12.5%) and "no response" (8.3%).

Comments About The Global Thinking Project

Questions 43-45 of the Teacher Questionnaire dealt with comments about positive aspects and problems associated with the Global Thinking Project, as well as the context in which teachers are using the project.

Teachers identified two primary positive aspects associated with the GTP.
These are:

1. students learned to think globally (60%).
2. students became aware of other cultures (40%).

Seven problems were deemed "serious" by teachers. These were:

1. poor computer literacy of students (45.5%).
2. lack of class time for project (22.7%).
3. curriculum materials (13.6%).
4. no equipment with which to work (4.5%).
5. poor network access (4.5%).

6. inability of project to motivate students (4.5%).
7. lack of teacher knowledge about environmental issues (4.5%).

To solve the above problems, several suggestions were made by teachers.

These are:

1. improve existing curriculum (31.1%).
2. increase technical support to teachers (25.0%).
3. increase funding for the project (12.5%).
4. encourage schools to be more flexible in scheduling classes (12.5%).
5. provide additional teacher training (6.3%).
6. provide partner schools (6.3%).
7. improve teacher cooperative learning skills (6.3%).

When asked if teachers wished to participate in the Global Thinking Project next year, the response was overwhelmingly "yes." Twenty-one teachers responded to the question in the affirmative, three provided no response, but most importantly no teachers chose not to participate in 1994.

Attitude Survey on Society and Environment

by Simon Vershlovsky
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Note: This questionnaire has been constructed by researchers in Leningrad, who are interested in finding out how young people in the United States and Russia view global issues. Because of the difficulties of exact translation between Russian and English, you may occasionally find items which are not entirely clear to you. On the last page of this instrument, you will be asked to make comments which could help these researchers in revising their questionnaire.

Thanks for you help in this project to promote international understanding.

Dear Friend,

By the end of the 20th century, all humankind is faced with critical global problems, each person's future as well as the fate of the whole world depends largely upon each individual's mindset toward these problems.

Through this survey, we ask you to reflect upon these most pressing problems. Please complete the following questionnaire.

Before you begin, please give us some information about yourself.

1. How old are you? _____
2. In what grade are you?_____
3. Your gender: Male _____ Female _____
4. Name of your school _____
5. City_____
6. State _____

Part A.

Please, read each question and then decide to what extent you agree with it by circling on the answer form:

1 - if you stongly agree
2 - if you agree
3 - if its hard to say
4 - if you do not agree
5 - if you strongly disagree

Your candid responses will help us to understand better the way young people today are thinking about such global problems.

Statements

1. To make the world better, people must start with themselves.	1	2	3	4	5
2. A person should use all the natural resources available during their live time and not worry about changing their lifestyle by saving such resources for the furture generations.	1	2	3	4	5
3. I try not think about my future because everything will be taken care of by itself.	1	2	3	4	5
4. I feel that school is preparing me well for my future profession.	1	2	3	4	5
5. Overall, I am completely content with myself.	1	2	3	4	5
6. To build new nuclear power plants means to create "ecological bombs."	1	2	3	4	5
7. The majority of people are inclined to think more of themselbes than to help others.	1	2	3	4	5
8. The day will come when the borders between countries will be abolished.					
9. As a rule, I come to school in a good cheerful mood.	1	2	3	4	5
10. People of different cultures and traditions can hardly be expected to get along together.	1	2	3	4	5

11. Any means are suitable to achieve an important goal.	1	2	3	4	5
12. Economic resources are not equally distributed between different nations.	1	2	3	4	5
13. During vacations, I miss my fellow students.	1	2	3	4	5
14. Humanking is more likely to perish because of total destruction of nature rather than through a nuclear bomb.	1	2	3	4	5
15. Our furture depends on how we live today.	1	2	3	4	5
16. I doubt whether it's worth abolishing capital punishment.	1	2	3	4	5
17. A human is the most sensible being in the whole universe.	1	2	3	4	5
18. I have every reason to be proud of my school.	1	2	3	4	5
19. The scientific and technological revolution is killing nature.	1	2	3	4	5
20. Any sacrifice may be justified for the sake of a better furture.	1	2	3	4	5
21. It is not necessary to attempt to retain the culture of smaller nations; it's important for manking to save the culture of great nations.	1	2	3	4	5
22. People's wrong doings should not be forgiven.	1	2	3	4	5
23. My school helps me to better understand the surrounding world.	1	2	3	4	5
24. One should look into the futrue with optimism.	1	2	3	4	5
25. If we want to stop degeneration of humans as a species, we must isolate people with incurable diseases.	1	2	3	4	5
26. Some individual human sacrifices are necessary for the sake of the welfare of the marjority.	1	2	3	4	5
27. The more rapid the technological progress, the more bland or colorless that culture becomes.	1	2	3	4	5
28. School helps me to understand myself better.	1	2	3	4	5
29. Ecological catastrophe could occur if we don't change the way natureal resources are used.	1	2	3	4	5
30. The future is mor important than the present.	1	2	3	4	5

31. A nation's character can be saved through isolating it completely from the influence of other nations.	1	2	3	4	5
32. Education is everybody's private business.	1	2	3	4	5
33. People by their nature are inclined to cooperation.	1	2	3	4	5
34. Without control of natural resources, further development of civilization is impossible.	1	2	3	4	5
35. Sports competition in world events contributes to war-like behavior between peoples of different countries.	1	2	3	4	5
36. A disagreement between a student and a teacher is a normal situation.	1	2	3	4	5
37. In all the history of the world, people have done more harm to themselves thatn good.	1	2	3	4	5
38. There is more to unite than to separate people of different nations and countries.	1	2	3	4	5
39. A person is part of nature and must live according to its laws.	1	2	3	4	5
40. It's hard to imagine that countries in conflict can come to agreement.	1	2	3	4	5
41. Our misfortunes should be blamed on circumstances and other people.	1	2	3	4	5
42. Nature belongs to people, so nature is not a chapel but a workshop for humankind.	1	2	3	4	5
43. One should repay evil with evil.	1	2	3	4	5
44. Every person's health is a national concern and society is responsible for it.	1	2	3	4	5
45. It's enough to study the culture of only highly developed nations.	1	2	3	4	5
46. International conflicts should be resolved only by way of negotiations.	1	2	3	4	5
47. I don't think that the fate of people in a hundred years depends on my attitude.	1	2	3	4	5
48. A person who is not with me is against me.	1	2	3	4	5

49. Health is dearer than wealth.	1	2	3	4	5
50. The interest of all humankind should be higher than that of any one nation.	1	2	3	4	5
51. Any rich country can solve ecological problems by itself.	1	2	3	4	5
52. It's not the society in which a person lives but the individual that matters.	1	2	3	4	5
53. When in school, I think of myself first as a person and then as a student.	1	2	3	4	5
54. Sometimes I think that I'm good-for-nothing.	1	2	3	4	5
55. No matter where people live, that are the same.	1	2	3	4	5

Part B.

Now that you have answered the questionnaire, we would like you to share your impressions of it.

Please answer these additional questions directly on this sheet.

56. Are the questions of the test important for you personally? Yes No

57. Have you previously thought about questions such as those on this test? Yes No

58. Indicate the questions that seemed most interesting to you. (Give their numbers)

59. In which item or items was the meaning unclear to you? (Give their numbers)

60. At the end of completing this questionnaire, would you please write down ten words that indicated things or ideas that are important to you.

a.
b.
c.
d.

e.
f.
g.
h.
i.
j.

61. Underline the five which are most significant to you.

62. What are your plans after graduating from school?

Thanks for your help in this study!

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